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A

TREATISE

ON

MINERAL, VEGETABLE, AND ANIMAL

POISONS,

CONSIDERED AS TO THEIR RELATIONS WITH

PHYSIOLOGY, PATHOLOGY, AND MEDICAL JURISPRUDENCE.

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TRANSLATED FROM THE FRENCH,

By JOHN WALLER,

SURGEON.

IN TWO VOLUMES.

VOL. II.

London:

PRINTED FOR E. COX AND SON, ST. THOMAS'S-STREET, BOROUGH.

SOLD ALSO BY A. DICKINSON AND CO., EDINBURGH; AND HODGES AND M'ARTHUR, DUBLIN.

1817.

J. M'Creery, Printer,
Black-Horse-Court, Fleet Street, London.

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A

GENERAL SYSTEM

OF

TOXICOLOGY.

CHAPTER III.

Class 3d. *Of Acrid Poisons.*

791. The name of acrid poisons has been given to such as possess a taste more or less caustic; and which, when applied to the surface of the body, produce inflammations, accompanied frequently by *phlyctenæ*, with loss of the epidermis; and which commonly terminate in suppuration. When introduced into the stomach, these poisons give rise to local phenomena, similar to those we have described under the article *corrosives*, notwithstanding the opinion of some physiologists who have pretended to establish distinctions drawn from the lesions presented by the animal texture after death. This truth will be placed beyond all doubt when we come to treat of the general principles relative to poisonous substances of this class.

OF WHITE HELLEBORE.

792. The white hellebore, *(Veratrum Album)*, Cl. Polygamia, O. Monœcia, Lin. family of the *Junci*, (of Jussieu), appears to be the real hellebore of the ancients.

Characters. Male flowers. Corollæ of six petals, considered by many botanists as a polygon of six equal divisions, coloured: six stamina. The same arrangement is found in the hermaphrodite flowers, which have beside three distinct germens, bearing short styles, and changing into oblong capsules, with two valves and several membranous sheaths arranged in two rows; the capsule opens into each cell by an interior suture: stem the height of one *metre*,* straight, simple, and cylindrical, terminated by a panicle of greenish white flowers, the corollæ of which are straight, or moderately open: leaves, very large, oval, lanceolated, sulcated by numerous and parallel ribs: root thick, fleshy, fusiform, yellow without, white within, of an acrid, bitter, and disagreeable taste; it excites a burning in the throat.

ACTION OF WHITE HELLEBORE ON THE ANIMAL ECONOMY.

Experiment 1st. At one in the afternoon a small dog was made to swallow two drachms and a half of the dried root, perfectly pulverized. At the end of five minutes the animal began to vomit, and in a quarter of an hour from the ingestion of the poisonous substance, he had already vomited six times some mucous bilious matter of a yellowish colour. At a quarter past two he was moaning, and making excessively deep inspirations; his mouth was filled with foam. At three, he walked about with great difficulty; staggered in every respect like a person intoxicated with wine. The next day at half past twelve, he had no longer any vertigo, and was able to walk about at his ease. The following day at nine o'clock, he ate very heartily, and since that time his health has been perfectly restored.

Experiment 2nd. At one o'clock the œsophagus of a to-

* A French measure of recent adoption equal to 3 feet 11 lines $\frac{3}{10}$. Tr.

lerably strong dog was detached and perforated, and two drachms of the dried root of white hellebore in powder, contained in a cone of paper, were introduced into the stomach, and the œsophagus was tied. At two, violent efforts to vomit; an hour and half after, dejection and moaning: the animal however walked about freely. At eight in the evening, very strong vertigoes: he died two hours after. The mucous membrane of the stomach was of a tolerably bright red throughout its whole extent, without any vestige of ulceration; that which lined the duodenum and jejunum was somewhat red; no sensible alteration in the other organs. Wepfer affirms that he administered to a puppy of three weeks old, a scruple of white hellebore mixed with milk: the animal instantly vomited it, had some alvine evacuations, and a few convulsive movements; an hour afterwards it appeared to be dead. In half an hour it was opened: the heart and diaphragm were contracting; the interior of the stomach was somewhat red. (Wepfer, *Cicutæ Aquaticæ Historia et Noxæ*, p. 219.)

Experiment 3rd. At eight in the morning an incision was made in the internal part of the thigh of a middle sized dog, and the wound sprinkled over with twenty grains of white hellebore powdered: the lips of the wound were brought together by several stitches, and the animal was muzzled, in order to prevent him applying his tongue to the part operated on. Six minutes after, he vomited; he lay down upon the belly, and made some moaning; at three-quarters past eight he had already made more than twenty times violent efforts to vomit, and had thrown up some bilious mucosities: he suffered such a degree of vertigo as rendered him incapable of advancing two steps without falling: he still retained the use of his senses, and uttered no moan: his eyelids were frequently agitated by a kind of convulsive movement. At nine o'clock he could no longer stand: the pulsations of the heart, which were strong, hurried, and irregular, did not appear to cor-

respond with the state of stupefaction in which the animal was plunged; he often performed the motions of deglutition. At half past nine, the eyelids and the pulsations of the heart were in the same condition; the inspirations were very deep; there was no convulsive movement, and the animal was so far sunk, that he might have been taken for dead. At ten o'clock the pupils began to be dilated. At one no change had taken place; he was shaken; he made a slight movement, and fell again instantly: the pupils were extremely dilated, and the snapping of the eyelids went on increasing. He expired at three in the afternoon. An hour after, he was opened: there was only a slight oscillation of the heart; the blood contained in both ventricles was fluid: the lungs, which were distended with blood, and somewhat less crepitating than in their natural state, were spotted over with some black patches: the interior of the rectum presented several black spots: the mucous membrane of the stomach was a little inflamed as well as the wound. Similar results were obtained with two other animals, except that in one case, the digestive canal had sustained no injury.

Experiment 4th. The same experiment was repeated upon a very robust dog, by sprinkling the wound with ten grains of white hellebore root finely powdered: twenty minutes after, he began to make efforts to vomit, and vomited ten times in the course of the succeeding twenty minutes. Three hours after, he was suffering greatly, and had very severe vertigoes, which were quieted during the night. The next morning he walked tolerably well, and made no more moaning. The following day he took a little food, and made his escape.

Experiment 5th. At six in the morning, a robust dog was made to take the fluid obtained by treating an ounce of white hellebore by boiling water. This fluid had been filtered and concentrated. The œsophagus was then tied: in five minutes the animal made efforts to vomit. At seven o'clock he began to experience a weakness in his posterior extremities: he

vacillated in walking. These symptoms went on increasing, and the animal died at eleven o'clock. He was opened the next day. The stomach contained a tolerably large quantity of thick mucus: it was very little inflamed. The mucous membrane of the rectum was of a red colour tolerably bright: the lungs exhibited livid spots; they were dense, and but little crepitating.

Experiment 6th. At eight in the evening, three drachms of the powder of white hellebore root, the soluble parts of which had been completely separated by boiling several times over in water, were applied to the cellular texture of the thigh of a small weak dog. Four days after, the animal had experienced no other symptoms than such as are inseparable from the operation. He died on the sixth day, and it was impossible on dissection to discover any alteration.

Experiment 7th. The same experiment was repeated upon another small dog, with three drachms of the same powder, which had not been boiled a sufficient time in water to deprive it of all its soluble parts: the animal died at the end of thirty-six hours: he did not begin to feel the symptoms of poisoning until ten hours after the application of the poisonous substance.

Observations.

1st. *Etmuller* says, in the Preface to his work on Surgery, that this root, when applied to the abdomen, produces a violent vomiting.

2nd. *Schreder* has observed the same phenomenon to take place in a case where this root was used as a suppository.

3rd. *Helmont* reports that a royal prince died in the course of three hours after taking a scruple of this poison, which induced convulsions.

4th. Given in the same dose, the root of hellebore has produced spasms, suffocation, loss of voice, and a coldness over the whole body. (Vicat, *Histoire des Plantes Vénéneuses de la Suisse*, p. 165. *Yverdon*, 1776.)

5th. A tailor, his wife, children and workmen, took some soup in which the root of white hellebore had been put instead of pepper. Shortly after, these persons were seized with a general coldness, and their bodies became covered with an icy sweat; their debility was extreme; they were almost in a state of insensibility; and their pulse could scarcely be perceived. At the expiration of two hours, the eldest child, who was not four years of age, began to vomit copiously, but with considerable straining; the rest were shortly after in the same condition. Vicat, who was called in at this juncture, ordered them to take a considerable quantity of warm water with oil, and shortly after gave them mallows tea sweetened with honey, by which means they were relieved, and completely restored. (*Idem*, p. 166.)

6th. *Theophrastus* asserts, that the vines, amongst which the white hellebore grows, yield a wine which provokes urine.

7th. Several authors affirm, that the root of white hellebore dried, powdered, and snuffed up the nose with the intention of producing sneezing, has caused abortions, floodings which it has been impossible to restrain, hæmorrhages from the nose, suffocations, and sudden death.

OF BLACK HELLEBORE.

793. Black hellebore (*Helleborus niger*) belongs to the Polyandria Polygynia of *Lin.* and to the family of the Ranunculaceæ of Jussieu.

Characters. Calyx permanent, composed of five or six broad leaflets, rounded, open, of a rose colour at first, becoming white as they expand, and resembling petals; five or more nectaria, called *petals* by some botanists, shorter than the calyx, in the shape of a funnel, or cone, with an irregular border, oblique, and as it were lipped: style sharp-pointed, curved a little outwards, the germens transforming themselves after their fecundation into as many compressed, oval, oblong

capsules, presenting at their extremities two keels, one short, and more rounded, the other more elongated, and terminating in a point: each capsule is a kind of follicule, opening only on one side: seeds round, attached to the opposite suture, which takes place of the placenta: flowers large, two inches in diameter, single, or placed two and two upon cylindrical stalks, simple or forked, appearing with the leaves: leaves large, radical, borne upon a petiole, equal at least to the stalk, divided at the top into seven or eight lobes, disposed in oblong pedals, serrated, pointed, of a brownish green, and leather-like; roots composed of one short stump, from which proceed several blackish fibres, frequently covered with a brownish down.

ACTION OF THE ROOT OF BLACK HELLEBORE ON THE ANIMAL ECONOMY.

Experiment 1st. A dog of middle size was made to swallow, fasting, two drachms forty-eight grains of this root. At the expiration of a quarter of an hour he passed a greenish stool: half an hour afterwards he vomited without any effort; these vomitings were repeated four times within the hour. The next day he fed with good appetite, and was perfectly recovered.

Experiment 2nd. At one o'clock two drachms and a half of black hellebore root, in powder, were introduced into the stomach of a very powerful dog, whose œsophagus had been previously detached and perforated; a ligature was then passed over it to prevent the expulsion of the poison. Two hours afterwards the animal made violent efforts to vomit. The next day at noon he was dejected, suffered greatly, and continued to make efforts to vomit; he walked about freely, and preserved the use of his senses. At eight in the evening he experienced vertigoes, staggered on walking, and had now and then some convulsive motions. He died during the night.

Dissection. The stomach was distended by a tolerable quantity of pultaceous matter, in which was suspended a part of the powder ingested; the mucous membrane presented a few points of a deep red colour; in the rest of its extent the colour did not appear altered; in some places it was ulcerated: these ulcers, which were in a longitudinal direction, and short, were principally found upon the folds which it forms on the interior surface of the stomach. The muscular coat was somewhat red; the serous coat, which was of a rose colour throughout, was covered with vessels strongly injected of a blackish brown. The interior of the duodenum, colon, and rectum, was extremely red; the other portions of the intestinal canal did not appear at all altered.*

Experiment 3rd. At two in the afternoon two drachms of black hellebore root, powdered, were sprinkled over a wound made in the interior of the thigh of a powerful dog. The lips were then united by a few stitches. At the end of six minutes the animal vomited some whitish fluid matter, and did not cease to make violent efforts to vomit during the first hour that elapsed; these efforts were sometimes ineffectual, at other times they were followed by the expulsion of a little yellowish bile. At forty-five minutes after two he was suffering such vertigoes that he was not able to make two steps without falling; his hind legs being excessively debilitated, he could not keep himself standing for a moment; he uttered plaintive moans; his pupils were not more dilated than natural. He fell afterwards into a state of general insensibility, and died at half past four. The mucous membrane of the stomach, and that of the rectum, were somewhat red; the lungs presented several places of a rose colour, and others which were livid, blackish, and dis-

* The inflammation of the *rectum* is a constant occurrence where the animals who have taken the black hellebore root have survived its administration for a few hours. *Vicat* has therefore been led into an error by asserting that this poison inflamed all the intestines *except only the rectum.* (*Histoire des Plantes Vénéneuses de la Suisse*, p. 69.)

tended with serosity: they were sufficiently crepitating; the wound was very little inflamed.

Experiment 4th. The same experiment was repeated upon a small young dog, with six grains of the same powder. There were no visible symptoms at the expiration of eight hours. The next day, twenty hours from the operation, the animal was lying down upon his side, and in a state of great dejection; he was quite insensible to external impressions: he might be moved like an inert mass of matter, and could not by any means keep himself on his legs. He died three hours after. No sensible lesion was perceived in the digestive canal, or in the lungs.

Experiment 5th. At seven in the morning, the fluid obtained by treating one ounce of black hellebore with boiling water, was introduced into the stomach of a big dog: this fluid had been filtered and concentrated; the œsophagus was afterwards tied. Ten minutes afterwards the animal made some efforts to vomit; he had also one liquid stool. At three quarters after eight, he experienced some slight vertigoes. At noon, the efforts to vomit were renewed frequently: the animal supported himself with the greatest difficulty; he was nearly insensible. At three o'clock he expired. The mucous membrane of the stomach was slightly inflamed; the interior of the rectum appeared of a cherry-red colour; very slight alteration appeared in the other parts of the digestive canal, the lungs shewed here and there some livid patches; they were dense, and but little crepitating.

Experiment 6th. At five in the morning, the cellular texture of the thigh of a small dog, was sprinkled over with two drachms of the powder of black hellebore root, the strength of which had already been exhausted by boiling water: the edges of the wound were then brought together by a few stitches. Three days after, the animal had shewed no other phenomena than that dejection which constantly accompanies this operation. He died on the fifth day: the limb

was scarcely inflamed, and no lesion appeared of the interior organs.

Experiment 7th. At half past two, were introduced into the stomach of a very strong dog, four drachms of an aqueous *alkaline* extract of black hellebore, in a solid form, which was prepared by a cold maceration of the dried root in water, sharpened by the sub-carbonate of potash, (this extract forms the base of *Bacher's Tonic Pills;)* the œsophagus was then tied. At half past eight in the evening, the animal experienced some vertigoes; he staggered in walking, and moaned a little. The next morning at nine o'clock he died. The mucous membrane of the stomach was of a cherry-red throughout its whole extent; there was no sensible lesion of the intestines: the lungs, which were in some parts distended with blood, were of a dark colour, inclining to black, and more dense than in their natural state. The ventricles of the brain contained no fluid; the veins running over the surface of this organ were distended with black blood; the pia mater was strongly injected.

Morgagni makes mention of a person who took half a drachm of black hellebore, and expired eight hours after. He experienced some pains, and was seized with vomiting. The whole of the digestive canal was inflamed; the inflammation was greater in the large, than in the small intestines; several portions of the latter presented alternately a state of constriction and relaxation; there was no gangrene: forty-two hours after death, the limbs were still flexible.

794. The preceding facts induce us to believe,

1st. That the powdered roots of white and black hellebore applied to the cellular texture, are rapidly absorbed, carried into the circulation, and give rise to violent vomitings, and different lesions of the nervous system, which the animals speedily sink under, and which seem to bear an analogy to those produced by the narcotics.

2nd. That their local effects are confined to the production

of a slight inflammation, not sufficient to occasion a speedy death.

3rd. That they act in the same manner when introduced into the stomach; but in this case their effect is slower, and less violent.

4th. That it may even happen in this case, that those animals are not destroyed which are allowed the power of vomiting; in the opposite case, their death is a constant result after certain doses.

5th. That the root of the white hellebore is more active than that of the black.

6th. That the part which is soluble in water, is that in which the poisonous property of these two species of hellebore resides.

7th. That the alkaline extract, which forms part of the Tonic Pills of Bacher, is likewise extremely active.*

The fetid hellebore is also capable of producing death. We read in the *London Chronicle*, 1768, No. 1760, that a child lost its life, from taking this root in the pulp of apple. It has likewise been seen, after its use, that persons have lost their hair, nails, and even the epidermis which covers the whole body. (*Oxford Magazine*, for the month of March, 1779, p. 99.)

OF BRYONY.

795. The genus *Bryonia* belongs to the family of the *Cucurbitaceæ*.

Characters. Flowers monœcious or dicœcious; calyx short, monophyllous, bell-shaped, with five *teeth:* corolla, adhering to the calyx, bell-shaped, or nearly resembling a rose, the border of which has five divisions, oval and veined. *Male flowers:* three stamina, two of which adhere together by means

* The water distilled from black hellebore root acts also upon the nervous system.

of the filaments. *Female flowers:* one style, having three divisions; stigmata grooved; inferior germen, egg-shaped, which, when ripe, becomes a spherical or oval berry, smooth on the outside, containing a small number of seeds.

Bryonia diaica (White Bryony). Stalks about two *metres* in length, slender, climbing, grooved, and somewhat hairy: leaves alternate, petiolated, angular, palmated, cordiform, covered with hairs, rough to the touch, presenting at their base a long tendril, rolled up into a spiral: root very thick, fusiform, externally marked in circles, fleshy, succulent, ramified, of a yellowish white colour, taste acrid, bitter, and disagreeable: flowers small, of a dirty white colour, marked with greenish lines: berries round, of a bright red when come to maturity. This plant is common in hedges. The root of bryony contains a juice extremely acrid, bitter, and soluble, which may be extracted by pressing it, and treating it with water: there remains in that case a feculent matter, which is sweet, and no way corrosive.

ACTION OF BRYONY ON THE ANIMAL ECONOMY.

Experiment 1st. At half past six in the morning, two drachms and forty-eight grains of a fine powder of the dried root of bryony, were applied upon the cellular texture of the interior part of the thigh of a dog of middle size. The animal died at the end of sixty hours, without having appeared to suffer any other symptom than a tolerably sharp pain. On opening the body, no lesion of the digestive canal was observed; the lungs were sound: the limb operated upon, exhibited an inflammation of some extent, which had terminated by suppuration.

Experiment 2nd. At ten in the morning, half an ounce of dried bryony root finely powdered, was introduced into the stomach of a small robust dog, and the œsophagus was after-

wards tied. At two o'clock, the animal did not appear at all incommoded. The next morning he was found dead. The blood contained in the ventricles of the heart was coagulated; the lungs, which crepitated but little, were of a reddish colour, and contained a tolerably large quantity of blood: the stomach, which was very red on the outside, contained almost the whole of the powder ingested; the mucous membrane, which was of a bright red, presented here and there blackish patches, not ulcerated: the interior of the great intestines was exceedingly inflamed; the other parts of the digestive canal were scarcely ulcerated.

Experiment 3rd. The same experiment was repeated at five in the morning, with three ounces of water, in which four drachms of powdered bryony root had been infused for two hours. At six in the evening the animal had experienced no other symptom than a great degree of dejection; he made little attempt to move; but had however no giddiness. He died during the night. At nine in the morning the body was examined: the heart was distended by a tolerably great quantity of blood, partly coagulated, and partly fluid; the lungs were rather red, and contained fluid blood; the mucous membrane of the stomach was of a cherry-red throughout its whole extent; that which lines the rectum was in the same state. The rest of the intestines, with the exception of the commencement of the duodenum, were in their natural state.

A number of observers have attested that the administration of bryony has been followed by violent vomitings, accompanied with faintings, sharp pains, alvine evacuations profuse, and of a serous nature, great thirst, &c.

796. These facts induce us to believe,

1st. That the bryony root acts upon men in the same manner as upon dogs.

2nd. That its effects may depend on the inflammation it produces, and the sympathetic irritation of the nervous system, rather than on its absorption.

3rd. That its deleterious property resides especially in the portion which is soluble in water.

OF ELATERIUM.

797. The *momordica elaterium* (Cucumber of the Ass, Wild Cucumber) is a plant of the family of the *cucurbitaceæ*, arranged by Linnæus in the *monœcia diandria*. It presents upon the same stem, *unisexual flowers* composed of a corolla monopetalous, salver-shaped, with a cylindrical tube, and a border divided into five lanceolated segments, open, with a small tooth. *Male flowers:* three stamina, two of which are connected by the filaments: the anthera are united. *Female flowers:* three stamina abortive: one inferior germen of three lobes, hairy, from which rises a style, which thickens insensibly, and terminates in a stigma clubbed. The fruit is an oval berry, very little fleshy, coriaceous, scarcely the size of the thumb, one-celled, capsular, covered with soft hairy points, opening with elasticity, and projecting the seeds to some distance. These are oval, angular, compressed, protected by an outer coat, and float in an aqueous pulp. The stalks lie on the ground, with a great number of ramifications, are thick, and abound with asperities, which render them prickly and rough to the touch. The leaves are petiolated, heart-shaped, the lateral lobes ear-shaped, scattered; and their petiole especially is thickly armed with prickly hairs. This plant grows in barren and stony grounds.

ACTION OF ELATERIUM ON THE ANIMAL ECONOMY.

Experiment 1st. At eight o'clock, three drachms of solid extract of elaterium dissolved in five drachms of water, were introduced into the stomach of a small strong dog, and the œsophagus was tied. Ten minutes after, the animal experienced

nauseas, and made some efforts to vomit. At half past eight the desire of vomiting returned, and the animal moaned greatly. At a quarter past ten he was lying on his side, without having the power of remaining on his feet for a single moment: his sensibility was diminished to such a degree, that he might be pushed, or moved from his place, without giving any signs of feeling. His breathing was deep, hurried, and was performed in a manner similar to that which takes place in persons labouring under abdominal inflammation; the animal still made efforts to vomit. At two o'clock he was found dead; and the examination of the body took place immediately. The heart no longer contracted; it contained only a small quantity of blackish blood; the lungs were of a rose colour, and less crepitating than in their natural state; they were moderately compact, and not much distended with blood; the stomach contained a certain quantity of a brownish fluid; the mucous membrane was of a fiery red throughout its whole extent, and presented here and there blackish points, without any ulceration; the rectum, which was sprinkled over with spots of a cherry-red colour, was evidently inflamed; there was no alteration in the other intestines; the body was not stiffened.

Experiment 2nd. At ten in the morning, three drachms of the extract of elaterium were injected into the cellular texture of the thigh of a middle sized dog. At two o'clock the animal exhibited no sensible phenomenon. The next morning he was found dead. The digestive canal was sound, except the rectum, the interior of which presented a few rose-coloured spots: the limb operated upon was penetrated by the injection, of a livid red colour, and exceedingly inflamed.

Experiment 3rd. The same experiment was repeated at five in the morning, upon a strong dog of large size. The next morning at seven o'clock, the animal had experienced only some dejection. He expired at three o'clock, and his death was preceded by a general insensibility. On opening the body,

no vestige of injury could be detected in the texture of the digestive canal, except in the rectum, which presented a few red spots; the limb operated upon was tumefied, and very much inflamed; the redness extended from the inferior part of the limb to the third sternal rib; there was a considerable degree of serous sanguineous infiltration; the lungs were sound.

798. These experiments induce us to think,

1st. That the first effects of elaterium are dependent on the inflammation it produces, as much as on its absorption.

2nd. That death, which is the consequence of the administration or application of this substance, must be attributed to the lesion of the nervous system sympathetically affected.

3rd. That besides, it exerts a special action upon the rectum.

OF COLOCYNTH.

799. The Colocynth *(Bitter Apple)* is the fruit of the *Cucumis Colocynthis* (Monœcia *Syngenesia* of Lin.), which belongs to the family of the *Cucurbitaceæ*, and grows in the islands of the Archipelago. This fruit is of the size of an orange, of a yellowish white colour, devoid of smell, round, dry, light, spongy, and composed of membranous layers. It contains a very great number of small cells, within which are lodged the seeds, which are flat, oblong, sweet, and emulsive: it possesses an acrimonious taste, exceeding bitter, and nauseous.

ACTION OF COLOCYNTH UPON THE ANIMAL ECONOMY.

Experiment 1st. The œsophagus of a middle sized dog was detached and perforated at nine in the morning, and three drachms of colocynth in fine powder enclosed in a paper cone,

were introduced into the stomach: the œsophagus was then tied. At two o'clock the animal had passed one liquid stool of a blackish colour. He moaned from time to time, but experienced neither vertigoes nor convulsions. At eight in the evening his respiration was a little accelerated and impeded; he no longer preserved the power of feeling or moving; he might be displaced like an inert mass of matter, and could not keep himself erect for an instant. He was lying upon the side; his legs, which were a little stretched out, without any remarkable contractions of their muscles, were not affected with any convulsive movements. He died at midnight.

Dissection. The stomach, in its interior, exhibited a violet red colour; it was distended with a great quantity of solid food, and a fluid, in which the powder of Colocynth was suspended. The mucous membrane of this viscus was strongly inflamed throughout its whole extent; it appeared of a blackish red colour in the portions corresponding with its great extremity, and in all its other parts, of a bright red: that which lined the duodenum, jejunum, ileum, cœcum, and the first quarter of the colon, was of a tolerably bright red: there was no alteration in the rest of the colon; but the rectum exhibited a very considerable number of patches of a fiery red.

Experiment 2nd. At eight in the morning a dog of middle size was made to swallow a Colocynth apple, which he vomited almost entire an hour after. The next day at eleven o'clock, his œsophagus was detached, and five ounces of white wine, in which two drachms of Venice Colocynth had been infused for six hours, were introduced into the stomach, and the œsophagus tied. At one o'clock the animal had made no effort to vomit. At six he passed two liquid stools, and complained with some vehemence. He died in the night. The lungs, stomach, duodenum, and the other small intestines exhibited no remarkable alteration: the mucous membrane of the rectum,

and of the inferior portions of the colon, was of a deep purple red. The subjacent muscular coat was likewise inflamed.

Experiment 3rd. Eight ounces of white wine boiling, were poured upon half an ounce of Venice Colocynth cut into small fragments. At the end of three days the liquor was poured off, and evaporated, to get rid of the alcohol; it was then introduced into the stomach of a dog of middle size, whose œsophagus had been previously detached and perforated. The next day the animal uttered complaints, was dejected, and passed two copious stools. He died twenty hours after the operation. The mucous membrane of the stomach was for the most part of a tolerably bright red colour; and exhibited here and there portions of a deep red; that which lined the duodenum and jejunum presented a similar alteration. The ileon, cœcum, and superior portions of the colon, were almost in their natural state; the interior of the rectum, and inferior portion of the colon, were the seat of a very considerable inflammation: several projecting bands of a blackish red colour were seen raised upon a ground of fiery red. The lungs appeared in their natural state.

Experiment 4th. At noon, a wound was made on the interior of the thigh of a dog of middle size; it was then sprinkled over with two drachms of Colocynth finely powdered, and the lips united by a few stitches. The next day at four in the morning, the animal did not appear very much incommoded; he uttered no plaintive moan, and walked about freely. He died in the night.

Dissection. The mucous membrane of the rectum was evidently altered; almost the whole of its surface was covered with points of a blood-red colour; the other portions of the digestive canal, and the lungs, shewed no visible lesion. The limb operated upon presented a tolerably extensive inflammation, accompanied by a sanguineous infiltration, which principally occupied the inferior parts. There was no eschar.

Experiment 5th. Two ounces of Colocynth finely powdered were digested for eight days in water; the liquor was then evaporated nearly to the consistence of a syrup, and was introduced at noon into the stomach of a dog of middle size, whose œsophagus had previously been detached and perforated. At half past twelve, the animal made violent efforts to vomit. At a quarter past four, he staggered, and experienced such giddiness that he fell down on making two or three steps. He still preserved however the use of his senses, and uttered no cry. At six, he shewed scarcely any signs of life; he might be displaced like an inert mass of matter, he was not agitated by any convulsive movements. At half past eight, he continued in the same state. He died at eleven at night.

Dissection. The stomach contained a part of the ingested liquor, mixed with a viscous blackish fluid; the mucous membrane was of a deep red colour, and exhibited streaks of a blackish red; the muscular coat was of a cherry red; the small intestines, cœcum, and colon, appeared very little altered; the mucous membrane of the rectum was extremely inflamed, and presented some longitudinal bands of a fiery colour: the lungs, which were somewhat distended with black blood, were nevertheless sufficiently crepitating. The veins situated on the surface of the cerebral lobes were very much distended with black blood; the pia mater was strongly injected, but no fluid was found in the ventricles of this organ.

Experiment 6th. At noon, a small dog was made to swallow fasting three drachms of Colocynth, which had been previously treated by boiling water until this fluid became colourless and insipid: the œsophagus was tied. The animal made some efforts to vomit: four hours after, he experienced some vertigoes, and died in the course of the night. The stomach was a little inflamed on its interior; a very slight alteration was just perceptible in the rectum.

Observations.

1st. A woman was subject to colics for the space of thirty years, in consequence of having taken an infusion of the pulp of Colocynth prepared with beer. (Fordyce, *Fragmenta Chirurg. et Med.* p. 66.)

2nd. A person took the decoction of three apples of Colocynth: he had copious and bloody alvine discharges; and would have sunk under them, if oil had not been speedily administered to him in glyster and by the mouth. (Tulpius, *Obs.* lib. iv. c. xxvi. p. 218.)

3rd. Dioscorides has observed, (lib. iv. c. clxxviii) that Colocynth, introduced into the rectum, produced a bloody flux.

4th. Lebret, a rag-merchant, swallowed three ounces of Colocynth, with the hope of getting rid of a gonorrhœa, with which he had been attacked for several days. A short time afterwards he felt severe pains in the epigastrium, and vomited abundantly. At the expiration of two hours he had copious alvine evacuations; the lower extremities became bent, his sight was obscured, and he could only hear with great difficulty; a slight delirium came on, which was succeeded by vertigo. He was made to drink a great quantity of milk, which produced vomiting: ten leeches were applied to the abdomen, and the symptoms subsided by degrees. (*Report made by the patient.*)

800. These data tend to prove:

1st. That the effects of Colocynth depend chiefly on its local action, and on the sympathetic irritation experienced by the nervous system.

2nd. That it is nevertheless absorbed and carried into the circulation, and that it acts also directly upon that system, and on the rectum.

3rd. That the active principle of this medicine resides both

in the portion soluble in water, and in that which is insoluble.

4th. That it acts on men as on dogs.*

OF GAMBOGE.

801. Gamboge is a gum-resin, obtained in the kingdoms of Siam and Ceylon, by making incisions in the leaves and young sprouts of the *Stalagmitis Gambogioides* (*Polygamia Monœcia*, WILD.). The wood of the *Gambogia Gutta*, L. (Polyandria Monogynia) furnishes likewise on incision, this substance in the form of a juice, which speedily concretes.

Gamboge is solid, of a deep yellow colour, bordering on red, becoming of a clear yellow on being moistened or powdered; of a shining fracture, very friable, opaque, without smell, or taste, at least if not allowed to remain too long in the mouth, in which case it gives out a taste slightly acrid; it dissolves partly in water and in alcohol, to which it communicates a yellow tinge. Alcohol thus charged furnishes on the addition of water, a yellow precipitate, which is thrown down with the greatest difficulty. The solution of potash entirely dissolves Gamboge; this solution is not rendered turbid by water; but is decomposed by the acids, which precipitate from it a substance of an extremely beautiful yellow colour, soluble in an excess of the acid.

* It should be remarked in the experiments relative to Colocynth and Elaterium, that when these poisons have produced death, after being received into the stomach, this viscus and the rectum are found to be inflamed, whilst the great bulk of the small intestines are in their natural state. This peculiarity exists, likewise, in a considerable number of poisonous substances; it appears to depend on the rapidity with which a part of the poison passes through the small intestines, and their long continuance in the stomach and rectum. It cannot be allowed, that it is always by virtue of a special action on this intestine that inflammation takes place; for it often fails when the poisonous substance has proved fatal, after having been injected into the cellular texture of the thigh.

ACTION OF GAMBOGE ON THE ANIMAL ECONOMY.

Experiment 1st. At ten in the morning, a small dog was made to swallow a drachm of Gamboge finely powdered. At the end of an hour he vomited some alimentary matter of a saffron colour, mixed with a certain quantity of the powder ingested. Ten minutes after, he vomited afresh; the animal was a little dejected. The next day he was perfectly recovered; he ate as usual, and had no more alvine evacuation. The following day he was made to swallow again two drachms forty-eight grains of Gamboge. At the end of an hour he vomited three times some yellow matter, and three hours after, he fed with a tolerable appetite: three days after, he was perfectly well. His œsophagus was detached and perforated, and a drachm and half of Gamboge, diluted with two ounces of water, were introduced into the stomach. He soon made efforts to vomit, and in the course of eight hours, passed a yellowish stool, tolerably copious. He died in the night. The mucous membrane of the rectum, and the descending half of the colon was of a red colour; the stomach, the other intestines, and the lungs, shewed no sensible alteration.

Experiment 2nd. At eight in the morning, a small stout dog was made to swallow fasting a drachm and half of Gamboge finely powdered; immediately after, the œsophagus was detached and tied. At the end of five hours the animal had passed several liquid stools of a yellow colour; he moaned, was dejected, and breathed with difficulty; there was neither convulsion nor paralysis. He died at six in the evening.

Dissection. The stomach was injected on the exterior, of a reddish colour, and presented in its interior a small quantity of a viscous fluid, of a brownish colour: its mucous membrane was for the most part red, and presented, in the folds near the pylorus, a deep red colour; the duodenum and jejunum were

slightly inflamed; the rectum was covered with a thin coat of Gamboge, and scattered over with a considerable number of streaks of a deep red colour. The lungs, which were rather livid, were less crepitating than in their natural state.

Experiment 3rd. At ten in the morning, the œsophagus of a dog of middle size was detached and perforated, and four drachms of Gamboge finely powdered, enveloped in a paper cone, were introduced into the stomach; the œsophagus was then tied. At two, the animal made violent efforts to vomit, but did not appear to be much incommoded. At eight in the evening he made no complaint, and preserved the free use of his senses and of his limbs; respiration was carried on nearly in the natural way. The next morning at ten o'clock, he was found dead. The stomach contained about four ounces of a fluid of no great consistence, in which was suspended the greatest part of the Gamboge; the mucous membrane of this viscus was covered with a thin coat of this gum-resin which could not be detached but by a scalpel; it then appeared of a fiery red colour, and dotted over with a multitude of points equally coloured. Some reddish spots were seen in the interior of the rectum. The other intestines were coated with a stringy yellowish matter, but presented no remarkable alteration. The lungs, which were of a deep red colour, were less crepitating than in their natural state, and distended with black blood.

Experiment 4th. At ten in the morning, a wound made in the thigh of a dog of middle size, was powdered with two drachms forty-eight grains of Gamboge finely powdered, and the edges were united by a few stitches. At eight o'clock, the animal had not had any evacuation; he walked well, and made no complaint. The next morning he was found dead. The digestive canal was nearly in the natural state; the lungs crepitated but little, were of a colour rather livid, and contained some black blood. The limb operated upon was inflamed and infiltrated; the inflammation and serous infiltration extended up the side to the sixth sternal rib. There was

a great quantity of Gamboge in the wound itself, and no eschar was perceived.

Experiment 5th. The foregoing experiment was repeated on a dog of the same size. The next day, at two in the afternoon, (twenty-four hours after the operation,) the animal walked about very well without making any complaint, and had no convulsive movement. He died in the course of the night. No alteration was perceived in the digestive canal, the excrementitious matter contained in the great intestines was of a yellowish colour. The limb on which the wound had been made exhibited a very considerable serous infiltration, and all the neighbouring parts were stained yellow by means of a slight coating of Gamboge. There was no eschar.

802. From these experiments it results :

1st. That Gamboge may be taken in a tolerably strong dose into the stomach of dogs that are suffered to vomit, without producing any serious accidents.

2nd. That in the contrary case it occasions a speedy death, which does not appear to depend on its absorption, but on the powerful local action it exerts, and on the sympathetic irritation of the nervous system.

3rd. That it destroys life rapidly when applied to the cellular texture, and that its effects are similar to those of an extensive burn, which produces no eschar.

OF THE FLAX-LEAVED DAPHNE *(DAPHNE GNIDIUM).*

803. This shrub belongs to the Octandria Monogynia of L. and the family of the *Thymalæ* of Jussieu. It is also vulgarly called *(Sainbois)* Spurge-flax.

The perigone (calyx) in form of a tube swelled out and contracted at its orifice, and which appears to serve for the corolla, of which the flowers of this plant are destitute ; whitish or reddish, divided into four lobes, and covered with a down

almost cotton, supported by a pubescent peduncle; eight stamina, with short filaments inserted into, and enclosed in the tube of the calyx; one short style with a headed stigma: one germen. The fruit is an oval or spherical berry, containing a succulent pulp, beneath which a thin shell is found, having one cell and one single seed; flowers small, in a panicle not much expanded: the stem two or three feet in height; divided from its base into several extended branches, abundantly furnished with leaves which are lanceolated, linear, very smooth, terminating in an acute point, scattered, numerous, close together, and near the summit of the branches almost imbricated. The Spurge-flax grows in dry and mountainous places in the southern provinces.

Character of the Bark. Fragments very long, not very thick, extremely flexible; outer skin brown, smooth, and yellowish on its internal surface. This bark has no smell; its fracture is fibrous, its taste acrid and burning.

ACTION OF THE FLAX-LEAVED DAPHNE ON THE ANIMAL ECONOMY.

Experiment 1st. At eight in the morning, a dog of middle size was made to swallow a drachm and half of the bark of Flax-leaved Daphne, reduced to a fine powder. Immediately afterward the animal's mouth was filled with foam, and he uttered plaintive cries. At half past ten, he vomited some alimentary matter mixed with something fluid, and refused to take food: he was somewhat dejected; the motion of the heart was somewhat more accelerated than before the operation. The next day he was in good health, and ate heartily. The day following at nine in the morning, his œsophagus was detached and perforated; three drachms of the same powder inclosed in a paper cone were introduced into the stomach, and the œsophagus tied. At three o'clock, he appeared very much dejected, without complaining; he had passed no stool, and the organs of sense

and motion retained all their faculties; the pulsations of the heart were frequent and slightly intermitting. At six in the evening, he was lying on the side, in a state of great dejection, and could not keep on his feet without the greatest difficulty. When it was attempted to make him walk, he fell down again, in order to lie on his side. The pulsations of the heart were scarcely perceptible, and slow; the animal exhibited no signs of convulsion or paralysis. He died at eleven o'clock at night.

Dissection. The stomach was distended, and of a livid red colour on the exterior. On opening it, it was observed to contain some considerable quantity of venous blood in a fluid state, mixed with a stringy blackish fluid, in which was suspended part of the powder ingested. The mucous membrane of this viscus was of a blackish red colour in several points, in others black; and exhibited here and there a very considerable number of small ulcers; the portion next the pylorus was hard, as if tanned; the muscular and serous coats were extremely red, and separated by a certain quantity of blood of a deep black colour; the effusion of this fluid was still more abundant between the mucous membrane and the subjacent coat. The interior of the duodenum was inflamed, and the redness diminished in the other small intestines, in proportion to their distance from the stomach. The rectum was very much inflamed; its mucous membrane presented generally a cherry-red colour; the lungs were somewhat hardened, and less crepitating than in their natural state.

Experiment 2nd. At two o'clock an incision was made in the interior part of the thigh of a small dog; the wound was then sprinkled with three drachms of Flax-leaved Daphne, finely powdered, and the lips of the wound were united by a few stitches; the animal uttered acute cries at the moment of the application of the bark. The second day after, at eight in the morning, he had not shewn any remarkable symptom; he was dejected, and remained in a corner of the laboratory; he

could nevertheless walk about freely enough. At ten o'clock his sensibility was diminished, and at two he remained lying on the side, without giving the smallest sign of feeling on the most violent agitation: his inspirations were rare and deep. He died at four. The digestive canal exhibited no trace of alteration; the inflammation in the limb operated upon, which was tolerably extensive, was accompanied by a copious sanguineous infiltration.

Vicat asserts that the Flax-leaved Daphne has given rise to a fatal diarrhœa.

The *Daphne Mezereum, Cneorum,* &c. produce nearly the same effects. Linnæus reports, that a young lady, labouring under intermittent fever, died spitting blood, from having taken twelve berries of the *Daphne Mezereum,* which had been given her with the design of purging her. (*Flora Suecica,* No. 338.)

Some person having given to an hydropic patient, the wood of Mezereon, the latter was all at once attacked with a diarrhœa, which was continual, and accompanied with insupportable pains; he had beside, for six weeks, vomitings, which returned every day with extreme violence, although, during the whole of that time, every proper remedy was had recourse to, in order to quiet them. (VICAT, *Histoire des Plantes Vénéneuses de la Suisse,* p. 140.)

804. The facts just described induce us to think:

1st. That the bark of the *Daphne Gnidium* is not absorbed.

2nd. That it gives rise to very powerful local inflammation; and sympathetic irritation of the nervous system, to which the fatal symptoms resulting from its administration ought to be attributed.

3rd. That it appears to exert the same action on the human species, as on dogs.

OF THE PALMA CHRISTI (RICINUS.)

805. The Palma Christi *(Ricinus Communus)* is a native of the Indies, and of Africa, of the Monœcia Monadelphia L., and of the family of the *Tithymaloides.*

Characters. Flowers unisexual, disposed in a spike paniculated and terminal, the inferior male, superior female. *Male flowers:* calyx, with five deep divisions; stamina numerous; filaments branching out; united in a bundle at their base. *Female flowers:* calyx parted off in three segments; germen, almost spherical, surmounted with three styles; cleft in two, and with simple stigmata. *Fruit:* greenish capsule, covered with soft prickles, with three furrows; having three valves, and three cells, containing each a single seed: stem reddish, branching, cylindrical, hollow, smooth: leaves palmated, with pointed and serrated lobes, and glandular petioles.

Characters of the Seeds. Oblong, flattened, oval, blunt at the extremities; shell brittle, thin, smooth, and spotted with black, of a very acrid taste; the nut whitish, insipid, oily.

ACTION OF THE FRUIT OF PALMA CHRISTI ON THE ANIMAL ECONOMY.

Experiment 1st. At eight in the morning, a small dog tolerably strong, was made to swallow thirty grains of the fruit of Palma Christi, in as great a state of division as possible. At the end of twenty minutes, he vomited without any effort some white matter, stringy and liquid, in which the ingested fruit was observed. At nine, he passed a stool, partly liquid, partly solid, and experienced no further inconvenience; in the course of the day he fed heartily. The following day at noon, a drachm and half of the same fruit suspended in two ounces of water, were introduced into the stomach, and the œsopha-

gus was tied, to prevent vomiting. An hour after, he had made no efforts to vomit, nor had passed any stool; he was dejected. At four o'clock, he passed a solid stool; he complained greatly, and died at six o'clock.

Dissection. The stomach contained a little fluid matter, in which was swimming some portions of the fruit of Palma Christi; the mucous membrane of this viscus, which lined the great extremity, was little inflamed, but easily detached in pieces: the intestinal canal and lungs presented no remarkable alteration.

Experiment 2nd. At nine in the morning, two drachms of the fruit of Palma Christi bruised, and enclosed in a paper cone, were introduced into the stomach of a dog, and the œsophagus was tied, to prevent vomiting. At the end of three hours, the animal had two stools, and he had already made several fruitless efforts to vomit. At four in the evening, he was extremely dejected, and moaned greatly, but preserved the free exercise of his senses and limbs. He died in the night. The mucous membrane of the stomach was only affected near the pylorus, where a circular patch was observed of a scarlet colour, as large as a crown of six francs, ulcerated in several places: these ulcers did not affect the subjacent coats. The interior of the rectum presented here and there inflammatory spots of a bright red colour. There was no sensible alteration in the other organs.

The same experiment was repeated at noon, upon another small dog with three drachms of the fruit of Palma Christi. Seven hours after, the animal had made some efforts to vomit, and passed one stool. The next day at noon he was expiring, in a state of complete insensibility, and could no longer stand upon his legs. He died a quarter of an hour after, without having exhibited any other phenomena than two or three deep inspirations, and a separation of the hind legs, which were somewhat stiff. He was immediately opened. The heart had ceased to beat; it contained fluid blood, and of a tolera-

bly bright red colour in the aortic cavity. The lungs were sound; the stomach contained a tolerable large quantity of yellowish matter, as it were oily, and mixed with curds likewise yellow; the mucous membrane was very little inflamed; the interior of the rectum presented here and there patches of a bright red. There was no alteration in the other parts of the digestive canal.

Experiment 3rd. Three drachms of the seeds of Palma Christi, deprived of their ligneous envelope, were introduced into the stomach of a dog of middle size; and the œsophagus was tied. The next day, he shewed no remarkable symptom. The day following, at eight in the morning, he experienced very severe vertigoes; it was impossible for him to walk without falling; he did not moan. At noon, he kept himself lying on the side, in a high degree of insensibility; his inspirations were rare and deep; the pulsations of the heart natural. He died at two o'clock. The mucous membrane of the stomach was not very red, and exhibited some small ulcers, the centres of which were black; the rectum, which was extremely red, was inflamed in its interior; the lungs, though crepitating, contained a small quantity of venous blood.

Bergius relates, that a robust man chewed a seed of Palma Christi, which he afterwards swallowed, and which produced a stinging sensation in the fauces. He passed the night quietly; but the next morning had copious vomitings, and during the whole day he made alternately efforts to vomit, and to go to stool, without however passing much.

806. These facts tend to prove that the seeds of the Palma Christi produce a local irritation, and that they act upon the nervous system after being absorbed.

OF EUPHORBIUM *(EUPHORBIA OFFICINARUM)*.

807. A plant of the family of the *Tithymaloides* of Jussieu,

and of the Dodecandria Trigynia of Lin. It is however Monœcious.

Characters of the Genus. Flowers composed of one calyx (looked upon by some botanists as an involucrum, and by others as a corolla) of one single piece, in form of a bell, permanent, having from eight to ten lobes, of which four or five are interior, straight, membranous, sometimes approaching at their summit, oval, pointed, and of an herbaceous colour; the other four or five, called *petals* by Linnæus, are alternate with the former, somewhat coloured, expanded, fleshy, oval, or heart-shaped, or in form of a crescent, having sometimes very remarkable teeth. *Male flowers:* to the number of eight or fifteen having a perigone concealed in the involucrum, composed of fine threads laciniated on the side (regarded by Linnæus as barren filaments); they have only one stamen each, every filament of which is articulated in the middle. *Female flowers:* single in the centre of the calyx, sometimes wanting; it appears deprived of its perigone; superior germen, rounded, three-sided, borne on a pedicle, inclined, or hanging on the side of the flower, surmounted by three bifid styles, with blunt stigmata. The fruit is a capsule rounded, smooth, or hairy, or having excrescences on the outside, borne on a pivot curved outwards, and formed of three shells joined together, each containing one roundish seed. The Euphorbia are all lactescent.

The *Euphorbia Officinarum* has the stem naked, with several angles, and the thorns double. There flows from its stalk a milky juice, which dries in small brittle pieces, which bear the name of *Euphorbium*, and with which we made the two following experiments.

Euphorbium is in irregular tears, frequently perforated; its colour is reddish on the exterior, and whitish within: it has no smell, its fracture is vitreous: when reduced to powder, it irritates the nostrils, even at a great distance.

ACTION OF EUPHORBIUM ON THE ANIMAL ECONOMY.

Experiment 1st. At one o'clock, the œsophagus of a very strong dog was detached and perforated: half an ounce of Euphorbium finely powdered, and enclosed in a paper cone, was introduced into the stomach. A quarter of an hour after, the animal uttered piercing cries, and made some efforts to vomit. The next morning at seven o'clock he was dejected, and continued to suffer pain. He died at three in the afternoon, without having shewn any other remarkable phenomenon than a great degree of dejection and insensibility.

Dissection. The stomach was very bulky; it appeared of a blackish red on the outside. On opening it, it was found to contain a very considerable quantity of a red, bloody fluid, mixed with powder of Euphorbium. The three coats of this viscus, and especially the mucous membrane, were black, or at least of a very deep red: the duodenum, jejunum, ileon, were little altered, and covered with a considerable quantity of a brown fluid, which was easily detached; the colon, and more particularly the rectum, were the seat of a remarkable alteration: the mucous membrane of the latter of these intestines, was of a fiery red colour in its inferior half, and exhibited three longitudinal bands of two lines in diameter, projecting, of a blackish red colour, and separated by some small ulcers; in its superior half it was black as charcoal, and exhibited likewise some small ulcers. The colon was considerably affected, yet much less than the rectum. The lungs did not appear to have been sensibly injured.

Experiment 2nd. At eight in the morning, a wound was made in the interior part of the thigh of a dog of middle size; it was sprinkled over with two drachms of Euphorbium finely powdered, and the lips of the wound united by a few stitches. The next day the animal was somewhat dejected, he uttered

no plaintive cry, and preserved the use of his senses and of motion. He died at half past eleven. The stomach, the intestinal canal, and lungs, were sound. The limb operated upon was very much inflamed; the redness, and sanguineous infiltration extended from the inferior extremity of the bone of the leg, up to the fifth sternal rib. There was no eschar.

Francis Dashwood (Philosophical Transactions p. 662, *year* 1760) asserts, that Mrs. Willis took by mistake, eighteen days after her lying in, two ounces of tincture of Euphorbium, prepared with two drachms of camphor, two ounces of rectified spirit, and two drachms of Euphorbium. Immediately after, she experienced a violent suffocation, a burning, and intolerable pain in the mouth and stomach. Mr. Willis administered, a few minutes after, a very great quantity of warm water, which produced copious vomitings. The patient complained however of a burning heat at the stomach; she was then made to take alternately oil and water; the vomitings continued. Some time afterwards Mr. Dymock ordered an ounce of ipecacuanha wine, which procured copious evacuations, both upwards and downwards; the matter evacuated was oily and camphorated: milk, and an opiate draught soon restored tranquillity. The phenomena produced by this draught ought to be attributed both to the Euphorbium and camphor. (See the article *Camphor).*

Experiment 3rd. At eight in the morning, eight ounces of the juice proceeding from the fresh leaves of the *Euphorbia Lathyris* (spurge), were introduced into the stomach of a very strong dog of middle size, and the œsophagus was tied. Three quarters of an hour after, the animal made efforts to vomit, and had passed three stools; he suffered only during the day some dejection. The next day at six in the morning, he continued to make efforts to vomit; the dejection was increased, and the animal remained lying upon the belly, without attempting to stir; he nevertheless preserved the power of

moving freely. At eleven, he began to agitate his feet in a convulsive manner: he died at noon. The next day he was opened. The lungs were livid, dense, distended with blood; the rectum presented here and there reddish spots; the other portions of the digestive canal were sound.

Sproegel reports that he gave to a cat twenty grains of the juice of Spurge, mixed with a little milk; which produced violent jerking of the head, cough, sneezing, trembling, and convulsions over the whole body. The animal was soon purged; from that time the cough ceased; the breathing became impeded, and was accompanied with a hissing noise; he made fruitless efforts to vomit, became motionless, and the eyes were closed. Some bread with milk and roots were given him; he vomited these, coughed afresh, and in the end recovered. The same writer applied upon his own face some of the juice of Spurge, which excited pustules similar to those of the nettle-rash.

This poison has been sometimes administered imprudently as a purgative, and produced vomitings and bloody stools: applied to the hairs, and to warts, it causes them to fall off: which proves that this plant is excessively acrid.

Experiment 4th. At seven in the morning, five ounces of the fresh juice of *Euphorbia Cyparissias* were given to a small robust dog, and the œsophagus was tied. The animal went several times during the day to stool. The next day he was dejected. The day following, he was still more so, but preserved the free use of his senses and of motion. He died in the night. The rectum exhibited some spots slightly red; the other organs appeared sound.

Vicat makes mention of a man who had his face excoriated, from having it rubbed with the juice of this Euphorbium. Lamotte speaks of a glyster prepared with this plant, which had been taken instead of mercury, the effect of which proved fatal.

There are a great many species of Euphorbia, which

are poisonous: such as, *Euphorbia Antiquorum, Euphorbia Canariensis, Euphorbia Tirucalli, Euphorbia Peplus, Euphorbia Helioscopia, Euphorbia Verrucosa, Euphorbia Platiphyllos, Euphorbia Palustris, Euphorbia Hiberna, Euphorbia Characias, Euphorbia Amygdaloides, Euphorbia Sylvatica, Euphorbia Exigua, Euphorbia Mauritanica, Euphorbia Nerifolia, Euphorbia Esula.*

Scopoli asserts that this last species produced death in a woman who, half an hour before, had swallowed thirty grains of the root of it. In other circumstances the same author has witnessed gangrene of the abdomen, and death to succeed quickly to the imprudent application of the *esula* to the abdomen. He moreover makes mention of a person who, having the eye-lids closed, allowed them to be rubbed with the juice of this plant. Inflammation soon after declared itself, and was followed by the loss of the eye.

808. It results from these facts:

1st. That Euphorbium exerts a local action extremely violent, capable of producing acute inflammation;

2nd. That its fatal effects depend rather on the sympathetic irritation of the nervous system, than on its absorption;

3rd. That it appears to act on the human species as on dogs.

OF SAVINE.

809. Savin *(Juniperus Sabina)* ranged by Jussieu in the Coniferæ, belongs to the Diœcia Monadelphia of Linnæus.

Male flowers: arranged in small catkins, egg-shaped, and sessile, disposed in three rows of verticillated scales, to the number of three in each row. These catkins comprise about ten flowers; that is to say, nine verticillated, three by three, and the tenth terminating the catkin. The scales are peltate, broad, lying one upon the other, and fixed to the axis of the catkin by very short peduncles: the flower has no corolla;

but there are found from four to eight anthera almost sessile, and with one cell. *Female flowers:* in globular catkins, formed of three concave scales, close together; at the base of each of them is a germen, the stigma of which is moist. The fruit is a small berry of a dark blue colour, nearly round, fleshy or succulent, formed by the union of the scales of the female catkin, which are thick, and glued together: it has on its summit three small points or eminences, produced by the superior scales of this catkin, and it contains three osseous seeds, oblong, angular on one side, and concave on the other; shrub from six to ten feet high, the bark of which is rough, and a little reddish; very branching; leaves extremely small, very closely pressed one to another, lodged upon the branches, which gives them the appearance of being imbricated; sharp-pointed, erect, opposite alternately, decurrent at their base; those at the extremity of the superior branches are somewhat loose; they all possess a strong penetrating smell, and a taste bitter, aromatic, and resinous. It grows in the southern provinces, and in the Levant, &c.

ACTION OF THE LEAVES OF SAVINE ON THE ANIMAL ECONOMY.

Experiment 1st. Six drachms of powdered Savine were introduced into the stomach of a large dog, and the œsophagus was tied. At the expiration of five minutes he uttered plaintive cries. Ten minutes after, the pains of the abdominal region appeared to be very severe, and the animal made great efforts to vomit. He died in the night, sixteen hours after the ingestion of the poisonous substance. The stomach contained a tolerably large quantity of free Savine, which preserved its aromatic smell: the mucous membrane, though not very red, was nevertheless inflamed; a small ulcer was found near the pylorus. The interior surface of the intestines, which was lined with a mucous and bilious matter, presented no

sensible alteration except in the rectum, where some reddish spots were seen.

Experiment 2nd. The same experiment was repeated upon a small dog, with four drachms of Savine. The animal died thirteen hours after the operation, and the interior of the stomach was found of a bright red colour; the rectum was likewise a little inflamed.

Experiment 3rd. At half past two an incision was made in the internal part of the thigh of a small robust dog; the wound was sprinkled over with two drachms of a fine powder of Savine, and the lips were brought together with a few stitches. The next day at noon, the animal presented no remarkable symptom; he died however in the night. The lungs and stomach were sound; the duodenum presented, near the pylorus, a blackish circular spot, of about one line in thickness, formed by extravasated blood; the mucous membrane, which formed a part of this circle, was of a deep red throughout its whole texture. There were, in the mucous membrane of the rectum, several spots of an obscure red. The limb operated on was infiltrated, and very much inflamed.

810. It results from these experiments,

1st. That Savine exerts a local action tolerably energetic;

2nd. That its effects depend principally on its absorption, and its action on the nervous system, the rectum, and stomach.

OF THE *RHUS RADICANS* AND *TOXICODENDRON.*

811. The *Rhus Radicans* is a plant of the family of the Terebinthaceæ of Jussieu, and ranked by Linnæus in the Pentandria Digynia.

M. Bosc, to whom we are indebted for some most excellent observations on this plant, has assured himself that it is only a variety of the *Rhus Toxicodendron*, from which it

differs only by its leaflets, which are smooth, and very entire; so that they ought to be confounded under the common denomination of *Rhus Toxicodendron.* The following is the description given by this enlightened naturalist, of this latter species.

" Root woody, horizontal, reddish, with fibres not very " numerous : stem woody, radicant, branchy, frequently " flexuose, brittle : the bark of a brown gray colour : branches " alternate, similar in every respect to the trunk; the supe- " rior ones only are radicant, the inferior perpendicular to " the trunk : the whole lengthened out, slender, seldom " branching, and only bearing leaves and flowers at their " extremity, upon the shoot of the year. The radicles radi- " cant, more or less numerous, they arise below the lowest " leaf, at the extremity of the shoots of the preceding year. " Leaves alternate, ternate, rising generally to the number of " four or five on the shoot of the year: the common petiole, " swelled-out at its base, almost cylindrical, more or less " hairy, from two to three inches in length, and one line " in diameter; the leaflets oval, lanceolated, acuminated, " sometimes angular, sometimes entire, sometimes smooth, " sometimes hairy; but always most on the inside, and still " more on the ridges; the middle ones three inches in length, " and two in breadth; the inferior ones almost sessile, un- " equally divided by the great ridge; the superior one petio- " lated to a great length; the angles, when any, are always in " small number, always obtuse, and shewing themselves only " at the half, or more frequently two thirds of its length. " Fructification dicœcious, having axillary thorns; the thorns " compound at the base, simple at the top, in the same " number as the leaves; the common axis flexuous, some- " what hairy, about an inch in length; flowers pedunculated, " single; the peduncles alternate, perpendicular to the axis, " scarcely one line in length : calyx of five leaves, attached to " a fleshy receptacle : the leaflets almost oval, smooth, cadu-

" cous, of a whitish green, scarcely half a line in length;
" corolla of five petals attached to a receptacle: petals lan-
" ceolated, caducous, twice as long as the calyx, smooth,
" curved back, and turned outward, of a white green, some-
" times veined with brown; stamina five in number, attached
" to the receptacle, shorter than the corolla: thread flattened,
" broader at its base, red: anthera yellow, almost oval, ex-
" cavated by a longitudinal groove; pistillum having an oval
" germen, very hairy, with a style thick, short and smooth,
" three brown stigmata, sessile, one of which is always bigger
" than the rest: fruit, a dry berry, nearly round, hairy, sul-
" cated by seven or eight longitudinal furrows, containing
" only one single seed. This plant is diœcious." *(Acts of the Society of Medicine of Brussels.)* It is extremely common in Carolina.

ACTION OF *RHUS RADICANS* ON THE ANIMAL ECONOMY.

Experiment 1st. A small dog was made to swallow three drachms of the dried powder of *Rhus Radicans:* the animal experienced no inconvenience.

Experiment 2nd. Two drachms and a half of the aqueous extract of *Rhus Radicans,* were applied upon the cellular texture of the back of a small dog; three days afterwards, the animal had not exhibited any remarkable phenomenon.

Experiment 3rd. At seven in the morning, half an ounce of the same extract was applied to the cellular texture of the interior part of the thigh. At ten, the animal had experienced nothing; it was still the same at six in the evening. The next day, at ten in the morning, he began to be somewhat dejected. At half past ten in the evening, he was insensible and motionless; respiration was scarcely carried on any longer; he could not possibly keep himself on his legs. A quarter of an hour after, he made two or three deep inspirations, and

died. He was opened the next day. The digestive canal was empty, and presented no lesion; the wound was slightly inflamed, and the limb operated on exhibited a serous sanguineous infiltration.

Experiment 4th. At eight in the morning, half an ounce of a watery extract of *Rhus Radicans*, was introduced into the stomach of a dog of middle size, and the œsophagus was tied. The next day, at ten in the evening, the animal had not yet appeared to be incommoded. The day after, at seven in the morning, he began to be dejected; he preserved however the free use of his senses and movements, and uttered no moans. At ten o'clock, he had very strong vertigoes, and fell down whenever made to walk; his head appeared heavy, his pupils somewhat dilated; he saw and heard well enough; the respiration was slow and rather impeded; there was no convulsion; he made no moaning. At one o'clock he was found dead, and the body was opened. The stomach contained a tolerably large quantity of a brownish and viscid fluid; the mucous membrane of a bright red in patches, evidently inflamed; no alteration in the intestinal canal; the blood in the cavities of the heart of a dark red colour, and fluid; the lungs red, extremely crepitating, containing a small quantity of blood.

Experiment 5th. A drachm of the same extract dissolved in three drachms of water, was injected into the jugular vein of a very robust dog. An hour and half after, the animal had vomited at six times, some bilious mucosities, and had passed one stool. The next day he was in admirable health. Thirty grains injected into the jugular vein of a small dog furnished similar results.

Experiment 6th. The same experiment was repeated upon a small dog, with one drachm six grains dissolved in two drachms and a half of water. He panted much, and appeared suffocated. He was put down on the ground, and was so insensible, that he was considered dead. He expired

one minute after, in the midst of a very evident trembling of the muscles of the whole body. He was instantly opened. The blood contained in the heart was fluid, and of a deep red colour in the left ventricle; the lungs in their natural condition.

Observations.

1st. The celebrated *Fontana* relates, that having touched at three different times, and at the interval of several days, some leaves of *Toxicodendron*, he experienced some serious symptoms: four or six days after, the eye-lids, the extremities of the ears, and in general every part of the face became tumefied, and appeared to be filled with an aqueous fluid. The spaces, which separate the fingers, became red, and were covered with small vesicles full of a transparent humor; the epidermis came off in little scales, and he felt a terrible smarting for the space of a fortnight, and an insupportable itching afterwards, for a fortnight longer; the pulse was greatly agitated. M. M. *Gouan* and *Amoreux*, have fully proved these vesicating effects on the skin.

The milk of these leaves produced no phenomenon when applied upon the cellular texture of rabbits, guinea pigs, and pigeons; the same thing happened when they were made to swallow it.*

2nd. *M. Boullon*, Physician of Abbeville, inoculated himself with the juice of the *Rhus Toxicodendron* with impunity. (Alibert, *Matiere Medicale*, tom. i. p. 450. 3rd Edition.)

3rd. *M. Van-Mons*, who has made an interesting work on this plant, is of opinion, that its hurtful effects depend upon a gas, which it exhales during the night, in the shade, and in cloudy weather, rather than on its milky juice. This gas, according to him, is nothing else than carbonated hydrogen, holding in solution a carbonated deleterious miasma. Its effects

* *Traité sur le Venin de la Vipere*, by Felix Fontana, tom. ii. p. 160. Florence, 1781.

on the animal economy vary according to the disposition of persons, and the circumstances under which they are placed: such an one, for instance, cannot pass near a *Toxicodendron* without feeling effects more or less disagreeable; another, on the contrary, may handle it with impunity. M. San-Mons, after collecting a certain quantity of this gas under a cylinder, covered with a case of black paste-board, induced his brother, who was extremely sensible to the effects of the *Rhus*, to plunge his hand into it. At the moment of the emersion, he experienced burning smart, which was succeeded by inflammation, hardness and swelling of the part. The same experiment repeated with the gas collected at noon day, and in a vessel exposed to the sun, was without effect. (*Actes de la Société de Medecine de Bruxelles.*)

812. The different facts we have just reported tend to prove:

1st. That the most active part of the *Rhus Radicans* or *Toxicodendron*, is that which is disengaged in a state of gas; whilst it does not receive the direct rays of the sun.

2nd. That it acts like the acrid poisons.

3rd. That the watery extract internally administered, or applied to the cellular texture, produces a local irritation, followed by an inflammation more or less intense, and that it exerts a stupefying action on the nervous system, after being absorbed.

4th. That it appears to act in the same manner when injected into the jugular vein.

813. The *Rhus Vernix* produces effects similar to those we have just described.

OF THE *ANEMONE PULSATILLA (WIND FLOWER).*

814. This plant belongs to the family of the *Ranunculaceæ* of Jussieu, and to the Polyandria Polygynia of Lin.

Involucrum cauline, deeply cut into threads hairy or narrow, placed two centimetres below the flower; corolla of from five to nine petals, oblong, straight, raised, and somewhat more hairy: a great number of stamina shorter than the corolla: capsules numerous, collected into a head, surmounted by a feathery tail; stalk without leaves, two feet high, cylindrical, hairy, bearing on its top a tolerably large violet flower: radical leaves, elongated, bipinnated, hairy, and whitish when young, nearly smooth when more advanced, and having segments fine and pointed. It is found on hills, that are dry and open.

ACTION OF *ANEMONE PULSATILLA* ON THE ANIMAL ECONOMY.

Experiment 1st. At one o'clock, a wound was made on the inside of the thigh of a robust dog; two drachms and a half of a watery extract of Anemone Pulsatilla, were applied upon the cellular texture, and the lips were united by a few stitches. The next day, at eight in the morning, the animal had experienced nothing remarkable. In the evening he was weak, but little sensible, and kept himself lying on the side. He had however no vertigo, nor did he utter any complaint. He died the day after, at five in the morning. The mucous membrane of the stomach was generally red; it presented here and there spots of a very bright red; the rectum was somewhat inflamed; there was no sensible alteration in the lungs; the limb was very much inflamed.

Experiment 2nd. At eight in the morning, the experiment was repeated with a dog of middle size, and one drachm only of the extract was employed; six hours after, the animal did not appear indisposed. The next day, at nine in the morning, he drank a tolerably great quantity of water, which he threw up shortly after; he was dejected, but was able to walk about. At eleven, he was lying on the side, and motionless;

his inspirations were rare and deep. At one o'clock, he continued to make efforts to vomit; his posterior extremities were so weak, that he could not stand on his legs. He died at four o'clock. Not the least alteration could be discovered by dissection, in the digestive canal. The wound was very much inflamed.

Experiment 3rd. At eight in the morning, five ounces and a half of the juice of the fresh leaves of Anemone Pulsatilla, were introduced into the stomach of a dog of a large size: (this juice contained three ounces of water, which was of necessity employed in order to extract it) the œsophagus was then tied. At nine o'clock, the animal began to moan; he made some efforts to vomit, and passed a tolerably copious stool. An hour after, the efforts to vomit, and the moaning continued as before. At one o'clock, he had passed two more stools, and was in a deplorable condition; lying on the side, insensible, and almost without motion, he might be pinched, and shaken any way, without giving the least sign of sense; the organs of sight and hearing were no longer susceptible of impression; the limbs, which were in a state of great relaxation, were not affected with any convulsive movement: the breathing was accelerated, and performed in a very painful manner. It was in vain attempted to raise him up; he fell down every instant, like an inert mass. These symptoms increased in violence, and the animal died at two o'clock. He was opened immediately. The heart contracted for ten minutes; it was then cut into; the blood contained in the ventricles was blackish and fluid; the lungs presented a greater degree of density than natural; they were not very crepitating, and sunk a little in water, especially when the more dense portions were submitted to this experiment. The stomach was distended by a tolerably large quantity of aliments, and contained a viscid fluid of a greenish colour; its mucous membrane presented a cherry-red colour in the third part of it nearest the pylorus; throughout the rest of its extent it was

of a deeper red, and scattered over with projecting patches almost black, in which could be easily discovered extravasated venous blood; the subjacent muscular coat appeared but little altered; the rectum, which was inflamed, and covered over with red spots; contained greenish excrements; the rest of the intestinal canal was as in its natural state.

Experiment 4th. We have frequently administered to dogs from four to six drachms of the dried powder of Anemone Pulsatilla; these animals appeared to experience no inconvenience.

Observations.

1st. *Helwing* asserts, that the syrup of Anemone Pulsatilla has given rise to fatal accidents.

2nd. *Bulliard* reports, that an old man affected for some time with rheumatic gout, applied to the calf of the leg the root of this plant bruised between two stones; and after drinking a bottle of wine, went to bed. He fell a prey to the most cruel sufferings, for ten or twelve hours, and the whole limb was gangrened. Scarifications were made in it, and compresses of camphorated spirit were applied; by these means the progress of the mischief was arrested, and the patient was entirely cured of this rheumatic affection. *(Histoire des Plantes Vénéneuses de la France, p. 79.)*

3rd. M. *P*—— apothecary, experienced a violent itching of the eyes, gripes, and vomiting, in consequence of pounding some dried Anemone Pulsatilla; these symptoms were all removed by diluent medicines.

815. We are of opinion, that it may be inferred from the preceding statements:

1st. That the Anemone Pulsatilla produces violent inflammation of the parts with which it comes in contact.

3nd. That it is absorbed, and carried into the circulation.

3rd. That it appears to act by stupefying the nervous system.

4th. That it likewise probably exerts an irritating action on the lungs and stomach.

5th. That its deleterious properties reside in every part of the fresh plant.

6th. Lastly, that its effects are much less, and become null on its being dried.

Many other species of this kind are poisonous.

1st. *Vicat*, has seen the extract of *Anemone Pratensis*, produce, in the dose of two drachms, gnawings in the stomach. *Bergius* reports, in his Materia Medica, p. 490, that the eye-lids of a child became red and tumefied, accompanied with dimness of sight, in consequence of having been exposed to the vapour arising during the evaporation of the juice of this plant, for the purpose of forming an extract.

2nd. The decoction of *Anemone Sylvestris*, according to *Bulliard*, has produced horrible convulsions, which placed the patient in a state of the greatest danger, and which only yielded to a strong solution of honey.

3rd. Such animals as browse on the young shoots of the *Anemone Nemorosa* (of the woods) experience weakness of the legs, trembling, and bloody stools, and die in the course of a few days. The inhabitants of Kamtschatka make use of this plant to poison their arrows, and the wounds are most commonly fatal.

4th. It is probable that the *Anemones Palmata*, *Narcissiflora*, and *Ranunculoides*, are equally poisonous.

OF ACONITE.

816. *Characters of the genus.* The Aconite, as ranged by Linnæus in the Polyandria Polygynia, and by Jussieu, in the *Ranunculaceæ*, presents a calyx with five leaflets, the superior one of which is concave, in the form of a casque; the petals are numerous, very small, in form of scales: the two superior ones, called *Nectaries* by Linnæus, are elongated, con-

cealed under the casque, furnished with a long claw, elbowed at the extremity, in such a manner that their border is reflected back, in the shape of a lip, and their extremity is thick, obtuse, in form of a crozier: the capsules are most commonly to the number of three, oblong, straight, pointed.

Aconitum Napellus. Stem straight, simple, firm, leafy, six decimetres in height, terminating in a spike, somewhat dense, the flowers of which are of a violet blue, tolerably large, close together, single upon their peduncle: leaves petiolated, palmated, multifid, with linear segments of a dark green, shining: little foot-stalks pubescent: the casque of the flowers is convex, and of a length double its height: the two petals concealed under the casque, have the top obtuse, tending very slightly to curl outwards. It grows in sheltered and moist places in the mountains. All the parts of the Aconite in the fresh state, when chewed, produce a sense of heat and pain in the mouth and throat.

ACTION OF *ACONITUM NAPELLUS* ON THE ANIMAL ECONOMY.

Experiment 1st. At noon, a small robust dog was made to swallow two drachms of the watery extract of Aconite bought at an apothecary's; a quarter of an hour after, the animal was somewhat drowsy, shut his eyes, hung down his head, then on a sudden raising it again, performing a motion similar to that of persons who awake after having fallen asleep standing, or in a chair. During this shock he was threatened with a fall upon his breech; the pulsations of the heart were regular, and somewhat accelerated. The next day, he experienced some vertigoes. He died the day following. The brain presented no alteration; the lungs, which were dense, and of a brownish colour, were distended with blood, and less crepitating than natural, the digestive canal was sound.

Experiment 2nd. Half an ounce of watery extract of

Aconite bought from another apothecary, and dissolved in an ounce of water, was introduced into the stomach of a small dog, and the œsophagus was tied. Four days after, the animal did not yet appear to be under the influence of the poison. He died on the sixth day, without having shewn any other symptom than the dejection inseparable from the operation. The opening of the body shewed no alteration of the internal organs.

Experiment 3rd. A drachm of the same extract was applied to the cellular texture of the back of a tolerably strong little dog. The next day, the animal was drowsy, walked about very well, but appeared very little disposed to motion. The pulsations of the heart were accelerated; he refused his food; he had neither vertigo nor convulsions. On the night of the following day, he died. The lungs were somewhat distended with blood, and less crepitating than usual; the brain and stomach shewed no alteration.

Experiment 4th. At twelve at noon, the same experiment was repeated with two drachms of the same poison, which was applied upon the cellular texture of the inside of the thigh of a small dog. Half an hour after, the animal had experienced no remarkable symptom; he was in the same condition at six in the evening. The next day, at one o'clock, he was in a state of great insensibility: he was lying on the side, and might be moved in any way like an inert mass; he could no longer stand; his fore legs were a little separated, and the animal stretched them out from time to time, as if he wished to stiffen them; but this motion was slow and feeble; the pupils were but little dilated; the organs of sense possessed almost all their faculties, and the animal uttered no cry; respiration and the circulation were performed slowly. He died in the night. He was opened on the following day. The limb operated on was livid on the exterior; on cutting into the skin, a very extensive inflammation was perceived, and a serous sanguineous infiltration; there were also several spots

formed by black extravasated blood. The stomach was sound; the rectum exhibited a few reddish spots; there was no alteration in the rest of the intestinal canal; the lungs were of a tolerably deep red colour, they contained a little black blood, and were sufficiently crepitating.

Experiment 5th. Thirty-six grains of the same extract dissolved in half an ounce of water, were injected into the jugular vein of a small dog. The animal instantly made water; he had some slight vertigoes, and made some fruitless efforts to vomit; the vertigoes went on increasing, to such a degree that, five minutes after the injection, he fell on his posterior extremities, which were weaker than the anterior. He was again raised up; and was drowsy, bending from time to time his hind legs. Six minutes after, he had a stool; the next day, he took food, and did not appear very ill. The day after, the vertigoes appeared afresh; he lay down on his side, was very little sensible, and died at the expiration of twenty-six hours. No remarkable lesion was discovered after death.

Experiment 6th. Thirty-six grains of the same extract dissolved in two drachms of water, were injected into the jugular vein of a small robust dog. The animal instantly began to howl; a short time after, he was excessively drowsy, and the organs of sense became insensible; he had no convulsions. Four minutes after, he made one last effort to breathe, and expired. He was opened the same moment. The heart was contracting with sufficient force; the blood contained in the left ventricle was fluid, and of a bright red; that contained in the right ventricle was coagulated and blackish. The lungs were rose-coloured, and crepitating.

Experiment 7th. One drachm and six grains of the resinous extract of Aconite, were applied on the cellular texture of the back of a small dog. At the end of five minutes, the animal was drowsy; a quarter of an hour after, he staggered;

the next day he was dejected, and refused food. He died on the sixth day. The internal organs did not appear altered.

817. These experiments were made with the extract of Aconite sold in the shops, and which is mostly prepared by making a very strong decoction of the plant, and evaporating the product at a temperature somewhat elevated. It was easy to foresee, that the extract so prepared would not be so active as that which should be obtained by expressing the juice of the fresh plant, and evaporating it in a water-bath. In fact, there exists a certain number of vegetable substances which become volatile at the temperature of boiling water; others are decomposed; and it is not to be doubted, that the black colour of the greater part of the extracts found in commerce, depends on the decomposition of one or several, of the principles which formed part of the vegetable. These considerations induced us to undertake fresh experiments with the intention of comparing the deleterious properties of these two kinds of extract of Aconite. We have extended these researches to the principal preparations of this kind used in medicine, and we are able to affirm, 1*st*. *That certain extracts prepared by expressing the juice of fresh plants, and evaporating them in a water-bath, are incomparably more active than those obtained by any other process.* 2*nd*. *That they are of a yellowish colour, which forms a singular contrast with the black colour of those found in commerce, which without doubt depends on the decomposition which these undergo by caloric.* 3*rd*. *That the extracts of those plants sold in the shops, differ greatly amongst themselves in regard to their action on the animal economy; that a great proportion of them possess no virtue: which circumstance, we are of opinion, ought to attract the attention of those Professors, whose duty it is to visit the shops.*

The correctness of these conclusions will be easily perceived on an attentive comparison of the preceding experi-

ments, with those which we are about to describe, which have been made with the extract of Aconite, prepared with the greatest attention.*

Experiment 9th. At eight in the morning, a drachm and half of the watery extract of Aconite, was applied to the cellular texture of the thigh of a small, but extremely robust dog. At a quarter past eight, the animal was agitated, he ran rapidly over the laboratory, and uttered plaintive cries. At thirty-five minutes past eight, he staggered; he laboured under very severe vertigoes, and preserved the power of seeing and hearing; the agitation went on increasing. A few moments afterwards, he lay down upon some straw, which he stirred up from time to time, for the purpose of forming a bed for himself. At a quarter past nine, he vomited a tolerable quantity of alimentary matter; the other symptoms had acquired a greater degree of violence. At half past nine, fresh vomiting; the animal, that had just been raised up, fell down upon the side, in a state of considerable stiffness, and pushed out his posterior extremities with some violence. Two minutes after, he recovered himself again, made a few steps with staggering, and uttered plaintive cries; his appearance denoted suffering. He died at three quarters after ten, and shewed no sign of paralysis in his posterior extremities.

Dissection took place at a quarter past eleven. The limb operated on was scarcely inflamed; the digestive canal presented no alteration; the heart was flabby, and contained black thick blood; the lungs were of a rose colour, bordering on deep red, and crepitating.

Experiment 10th. At a quarter before nine, two drachms ten grains of the same extract, were introduced into the stomach of a small dog tolerably strong, dissolved in an ounce of water; and the œsophagus was tied. Twenty

* M. Richard, private teacher of Chemistry, and apothecary to the Hospital of the *Charité*, undertook to furnish us with the extracts such as we have described: we wish to testify towards him all our gratitude.

minutes after, the animal made efforts to vomit; his posterior extremities began to grow weak, and he was in a remarkable state of agitation; he preserved the free use of his senses and movements; he nevertheless staggered. At twenty minutes after nine, he was lying on the side, moaning, and exhibiting convulsive motions in the head; he was put on his feet, with the design of making him walk: he made a few steps staggering, and lay down again; his posterior extremities were entirely paralyzed, and he appeared to be in great pain. At three quarters after nine, the agitation was extreme: the animal uttered piercing cries, walked from right to left, dragging the hind feet after him, and after having crossed the laboratory in different directions, fell down again; the convulsive contractions of the muscles of the head, communicated to this part quick motions, which might be compared to the shocks occasioned by the electric fluid accumulated in frogs: the organs of hearing and vision appeared to exercise their functions freely. These symptoms acquired a fresh degree of violence, and the animal died a quarter before eleven. He was opened half an hour after. The mucous membranes of the stomach and duodenum were slightly inflamed; the rectum presented no alteration; the lungs were crepitating; the ventricles of the heart contained a very great quantity of blood, which was coagulated, and extremely black.

Experiment 11th. *Wepfer* gave to a wolf, two pieces of meat containing about two drachms of the root of *Aconitum Napellus*. Eight minutes had scarcely elapsed, when the animal vomited one of the pieces, together with viscid and frothy mucosities; he felt pain in the belly, and vomited again. Perceiving a short time after, that he was in very good health, two drachms of the same root divided were given to him in some whey: he soon vomited several times, and frequently contracted the abdomen. Half an hour after, he agitated his fore paws with some violence, dug a bed for himself in the ground, and lay down on the side. He was made to get up and walk

about, and he began again to dig: he experienced a general trembling, but neither vertigo nor convulsions. He lay down again on the side, and made efforts to vomit; his mouth was filled with foam. The abdomen was cut open, and he expired two hours after the ingestion of the first bolus, without shewing the least signs of pain. The stomach contracted; the intestines, which were animated by their peristaltic motion, contracted also, without the excretion of any excrementitious matter; the interior of the digestive canal was inflamed in several points; several living worms were perceived in it; the right auricle and ventricle contained a small quantity of frothy blood, and a considerable quantity of clots; the left ventricle contained only one of these clots in its superior part. (*Op. citat.* p. 178).

Experiment 12th. *Bonetus* administered to a dog three weeks old, half a drachm of the fresh root of *Aconitum Napellus* well divided; the animal died two hours afterwards. The symptoms which he experienced were vomitings, convulsive movements of the whole body, and weakness in the posterior extremities; the stomach was not inflamed; the blood was fluid, and the bladder contained a great quantity of urine. (*Sepulchretum Boneti*, p. 493. tom. iii. *Lugduni*, 1700.)

Experiment 13th. At eight in the morning, five drachms of the fresh root of *Aconitum Napellus* bruised, were introduced into the stomach of a strong dog of middle size, and the œsophagus was tied. Five minutes after, the animal began to make violent efforts to vomit; he moaned; ran rapidly over the laboratory with a wild air, and was evidently much agitated. At eleven minutes after eight, he experienced slight vertigoes, and had scarcely ceased for a moment to moan, and to make efforts to vomit; he uttered loud cries, and began to be no longer able to support himself on his hind legs. Three minutes after, he fell down while attempting to walk; he was raised up, but soon fell again; the pulsations

of the heart were unequal, sometimes strong, at others weak; the pupils were dilated; there was no convulsive movement; and the animal preserved the free use of his senses. At seventeen minutes after six, the pulse beat a hundred and fifty strokes in the minute; it was regular and strong, the animal was motionless, and nearly insensible. At twenty-one minutes after eight, he all at once bent back his head upon the back, and his legs became stiff and separated: this state continued two minutes; he then expired. He was immediately opened. The heart no longer contracted, even after the irritation occasioned by opening the pericardium; it was very much distended, and contained blood of a vermillion colour and fluid, in the aortic cavities. The right ventricle was filled with black blood, likewise fluid; the lungs appeared sound; the stomach contained almost the whole of the root ingested; its interior coat was scarcely red.

Experiment 14th. At seven in the morning, two ounces of the juice of the fresh leaves of *Aconitum Napellus*, to which had been added an equal quantity of water, were introduced into the stomach of a robust dog of middle size: the œsophagus was then tied. A short time after, the animal appeared agitated; at ten o'clock, he experienced no other sensible phenomenon. At seven in the evening, he had frequently made efforts to vomit; was somewhat drowsy, and the posterior extremities began to grow feeble; he preserved however the use of his senses, and the free faculty of motion; his breathing was deep. The next morning at six o'clock, he was found dead. The stomach was filled with a blackish fluid, of a bilious appearance; there was no vestige of inflammation in the digestive canal; the heart was filled with black coagulated blood; the lungs, not very crepitating, presented several livid patches, dense, and distended with blood.

Experiment 15th. M. Brodie injected into the rectum of a cat, an ounce of juice of Aconite leaves. Three minutes afterwards, the animal rejected almost the whole of the fluid,

and remained quiet for six minutes; he then vomited, and attempted to walk; but staggered as if drunk. Thirteen minutes after the injection, he was lying upon the side, motionless, except that he shewed from time to time some slight convulsive motions of the limbs. Respiration became slow and painful, and he appeared to be dead forty-seven minutes after the experiment. A few moments before he expired, the heart beat a hundred regular pulsations a minute.

Experiment 16th. The same physiologist applied upon the cellular texture of the side of a young rabbit, about twenty drops of the juice of Aconite leaves. At the end of twenty-three minutes the same symptoms took place, and the animal died forty-seven minutes after the application of the deleterious substance. (*Philosophical Transactions, anno* 1811, p. 1, page 185 and 193.)

If, says M. Brodie, the leaves of Aconite be chewed in small quantity, a sensation of numbness is felt in the lips and gums, which does not subside till after two or three hours.

Observations.

1st. *John Crumpler*, at eight in the evening, ate some salad, in which had been put, by mistake, a certain quantity of *Aconitum Napellus*. He felt immediately a burning heat on the tongue and gums, and a great irritation in the cheeks. He thought that the blood no longer circulated in his limbs; he had however no inclination to vomit. Perceiving the symptoms to go on increasing, he drank about a pint of oil, and a great quantity of tea, which made him vomit. The symptoms, far from disappearing, were aggravated. At ten o'clock, *Vincent Bacon*, an English surgeon, was called in, and found the patient in bed, his eyes and teeth fixed, the hands and feet cold, the body for the most part covered with a cold sweat, pulse scarcely perceptible, and the breathing so short, that it could with difficulty be perceived. He made

him swallow two spoonfuls of spirit of hartshorn, which occasioned coughing and vomiting: he then administered to him the infusion of *Carduus Benedictus*, until several vomitings were procured. The patient shortly after had a stool, and vomited afresh. The pulse became a little raised, but was intermitting, and extremely irregular. A draught was given of *Aq. epidem. Ther. Androm. Conf. Alkerm*, with a few drops of *Sal Volatile* and *Tinct. Croci*. The next morning, he was a great deal better, and the cure was soon completed.*

2nd. The root of *Aconitum Napellus* was administered to four highwaymen. Two of them, after having experienced the most violent pains, were saved by appropriate means; the other two died, one of which, a few hours after the administration of this root, became an idiot; the face was covered with a cold sweat; asphyxia, spasms, and syncope took place; he passed involuntary stools; vomited bilious and livid matter; his body swelled, and he died apoplectic.†

3rd. *Willis* relates that a man died mad, and in a very short time, in consequence of having eaten a salad, in which there were some of the fresh leaves of *Aconitum Napellus*. (*De Animâ Brutorum*, p. 289.)

4th. The juice of Aconite, introduced into a small wound made in the thumb, has been known to give rise to pains in the fingers and arm, cardialgia, anxiety, with fear of suffocation, lipothymia, agitation, and finally gangrene and copious suppuration.‡

818. It results from the facts just related,

1st. That the juice of the leaves of Aconite, introduced into the stomach or rectum, or injected into the cellular texture

* *Philosophical Transactions*, vol. xxxviii, p. 287, anno 1734, obs. iii.

† *Mathiolus in Dioscorid. ed. C. Bauch*, p. 768, tom. ii. p. 1.

‡ *Alberti Jurisprudentia Medica*, tom. vi. p. 724. *Obs. de Rodder.*

of dogs, produces serious accidents, followed by a speedy death;

2nd. That the same happens from the root of this plant, the effects of which appear still more decided than of the leaves;

3rd. That the watery extract of Aconite prepared by expressing the juice of the fresh plant, possesses nearly the same poisonous properties as the juice, whilst at the same time it is incomparably less active when it has been obtained by decoction.

4th. That the resinous extract is more energetic than the watery one.

5th. That these different preparations are absorbed, and carried into the circulation; that they act particularly on the nervous system, and more especially on the brain, where they produce a kind of mental derangement.

6th. That they exert besides a local irritation capable of producing inflammation more or less violent.

7th. That they appear to act on the human species as on dogs.

The *Aconitum Cammarum*, Monk's Hood, is possessed of a flavour more acrid than the preceding, and of extremely energetic properties.

1st. *Mathiolus* relates, that a criminal condemned to death, ate some of the root of this plant. He perceived a tolerably strong flavour of pepper, and at the end of two hours was seized with vertigoes, and commotions of the brain so violent, that he thought his head full of boiling water; a general swelling of the whole body took place; the countenance livid; the eyes were out of their sockets; in fine, the unfortunate man died in most horrible convulsions.

2nd. We find in the *Sepulchretum* of Bonetus, and in the *Memoires de l'Académie de Suède*, facts similar to the preceding. Formerly arrows were poisoned with the juice of this plant.

The *Aconitum Anthora* appears also to be poisonous. *Hoff*

man says, that it overturns the stomach, and occasions a burning heat accompanied with thirst and anguish about the heart. *Solier*, *Lobel*, and *Prevot*, have seen this root produce vomitings and stools. How then could it happen that the ancient Authors have announced this root as the antidote of the other species of Aconite.

Aconitum Lycoctonum (Wolf's Bane). The root of this plant mixed with salad occasioned considerable uneasiness to several guests who partook of it. Others have felt vertigoes, heat, and swelling of the tongue, in consequence of having chewed the flowers of this species of Aconite. (*Bauhinus*, l. c. p. 653.)

OF CELANDINE.

819. The Celandine *(Chelidonium Majus)* belongs to the Polyandria Monogynia of L. and to the family of the *Papaveraceæ* of Jussieu.

Characters. Calyx caducous, composed of two oval leaflets, concave: corolla, of four petals, nearly round, open, and of a yellow gilt: the stamina are numerous, with threads distinct from one another, and equal in length. The fruit is a cylindrical pod, simple, bilocular, knotty, containing several seeds. Its stalks are cylindrical, branching, and slightly hairy; its leaves are winged, large, soft, incised, of a tender green colour above, and of a sea-green below; from the axilla of these leaves proceed peduncles naked, and in umbel, which bear four, five, or as many as nine flowers, each of which has its peduncle and stipula. The root is of a reddish brown when fresh, and black when dried. Whatever be the part of the Celandine in which an incision is made, there flows out a yellowish juice, which is bitter, caustic, of a disagreeable smell, and which is employed for the purpose of destroying warts and corns. It grows every where, in hedges, chinks of old walls and ruins, especially in the shade.

ACTION OF CELANDINE UPON THE ANIMAL ECONOMY.

Experiment 1st. Three drachms of the watery extract of Celandine, were introduced into the stomach of a small feeble dog, and the œsophagus was tied. At the end of six minutes the animal made violent efforts to vomit: four hours after, he was lying on the side; he made deep inspirations; sensibility and mobility were diminished to such a degree, that the organs of hearing and vision were no longer capable of receiving impressions; and he was not able to stand. He died a very short time after. The stomach contained a small quantity of a fluid excessively viscid, and of a brownish colour; the mucous membrane was of a bright red throughout its whole extent, and of a blackish red in its folds; the intestinal canal was not altered; the lungs were of a reddish colour, crepitating, and appeared not to be affected.

Experiment 2nd. At three o'clock, an incision was made in the inside of the thigh of a small dog, and a drachm and half of watery extract of Celandine dissolved in a small quantity of water, was applied to the wound. At five, the animal experienced nothing remarkable. The next day, at nine in the morning, he was found dead. The digestive canal exhibited no sensible lesion; the wound was inflamed, and the lungs somewhat livid.

Experiment 3rd. At seven in the morning, the above experiment was repeated upon a dog of middle size, with two drachms of the same extract. At four o'clock, the animal had experienced nothing remarkable. At ten in the evening, he was hardly sensible, was lying down on the side, and could no longer perform any motion. He died in the night. The digestive canal presented no alteration; the lungs were livid, distended with blood, and but little crepitating; the limb operated on was tumefied, infiltrated, and very much inflamed.

Experiment 4th. Four ounces of the juice of Celandine prepared with the leaves, were introduced into the stomach of a dog of middle size; the œsophagus was tied. The animal made efforts to vomit, moaned, and became insensible. He died ten hours after. The mucous membrane of the stomach was inflamed; the lungs presented here and there livid patches somewhat distended with blood.

820. From the preceding facts it results,

1st. That Celandine and its extract produce serious symptoms, followed by death.

2nd. That their deleterious effects seem to depend on the local irritation they excite, as much as on their absorption and action on the nervous system.

3rd. That it appears to act also on the lungs.

OF STAVESACRE.

821. Stavesacre *(Delphinium Staphysagria)* belongs to the Polyandria Trigynia of L. and to the family of the *Ranunculaceæ* of Jussieu.

Seeds triangular, and even quadrangular, curved, shagreened, of a brownish colour; shell brittle, thin, of an acrid bitter taste; almond white, insipid; albumen horny; embryon straight, superior, radicle inferior.

ACTION OF STAVESACRE ON THE ANIMAL ECONOMY.

Experiment 1st. An ounce of Stavesacre reduced to a fine powder, was introduced into the stomach of a small robust dog, and the œsophagus was tied. Two days after, the animal was dejected, but had experienced neither vertigo or convulsions. He died fifty-four hours after the operation. The mucous membrane of the stomach presented a crimson red colour in the third part of its extent next the pylorus, the

other parts were somewhat less red; there was no sensible alteration in the other organs.

Another animal submitted to the same experiment furnished similar results, except that he died at the expiration of fourteen hours.

Hillefeld made dogs swallow the infusion of Stavesacre; these animals died, after having had vomitings, involuntary stools, general trembling, and great debility.

Experiment 2nd. A wound made in the inner part of the thigh of a dog, was sprinkled with two drachms of this same powder, and the lips were united by suture. The animal had not shewn any remarkable symptom seventy-two hours after the operation. He died in the night of the third day. The lungs and digestive canal were sound; the limb operated on contained on the surface of the wound, a tolerable quantity of the powder employed; it appeared of a greenish colour; the inflammation, which was not very violent, had terminated in suppuration.

Experiment 3rd. The same experiment was repeated at seven in the evening, with two drachms of Stavesacre slightly *moistened.* The next day, the animal was somewhat dejected. The day after, at six in the morning, he experienced such vertigoes that he could not walk without falling; he uttered no plaintive cry, and preserved the free use of his senses. He died at noon. The digestive canal presented no alteration; the lungs were reddish, and more dense than natural; the limb operated on was swelled, infiltrated, and very much inflamed; the inflammation extended up to the fourth sternal rib. There was no slough.

822. These facts induce us to believe,

1st. That Stavesacre is not absorbed, and that its deleterious properties depend on the local irritation it produces, and the sympathetic lesion of the nervous system;

2nd. That the part soluble in water is the most active: so likewise the local effects of its administration are more severe

when it is moistened before being applied to the cellular texture.*

OF THE MEADOW NARCISSUS.

823. The Meadow Narcissus *(Narcissus Pseudonarcissus)* belongs to the Hexandria Monogynia of L. and to the family of the *Narcissi* of Jussieu.

Characters. Calyx coloured of a pale yellow, of six equal pieces, which many botanists call a corolla: nectary campanulated, of a deeper yellow, of the length of the petals, folded in the upper part, indented, divided into six parts to the top, and containing six stamina: stalk *(scapus)* compressed, of eight or ten inches high, surrounding always the base of the flower, which is large, terminal, and bent downward: leaves to the number of two or three, plain, obtuse, not so long as the stalk, inclining to a sea-green. This plant is found in woods and meadows.

ACTION OF THE MEADOW NARCISSUS UPON THE ANIMAL ECONOMY.

Experiment 1st. At half past nine, there were introduced into the stomach of a young dog of middle size, four drachms of a watery extract of Meadow Narcissus, and the œsophagus was tied. At the end of an hour, the animal made efforts to

* We often omit noticing the state of the brain in those animals that died after having taken any kind of poisonous substance; we have nevertheless examined this organ in almost all the dissections we have made; but it has rarely exhibited any notable lesions. How often have we seen animals die in consequence of a direct lesion of the nervous system, without being able to discover, after death, the slightest change in the colour, structure, and consistence of the contents of the head. This fact, which is moreover agreeable with what is observed in a multitude of patients who die of nervous affections, renders it unnecessary for us to speak of that organ, at least unless it should be the seat of some evident lesion.

vomit. At noon, he had one stool, which contained a tolerable quantity of solid matter. Forty minutes after, he made fresh attempts to vomit. At eight in the evening, he was somewhat agitated, uttered plaintive cries, and experienced some slight giddiness; his breathing was not at all impeded. He died in the night. The left lobe of the lungs presented, near its inferior edge, a violet-coloured spot, containing venous blood, and as broad as a crown-piece; the remaining portion of this viscus was sound.* The stomach contained a small quantity of a mucous brownish fluid, which could easily be detached; the mucous membrane presented several irregular spots, tolerably extensive, of a cherry-red colour, without any apparent ulceration; the duodenum was somewhat inflamed; the mucous membrane lining the inferior part of the rectum was rather red; the ventricles of the brain contained no serosity; the veins creeping over the external surface of this organ were distended with black blood.

Experiment 2nd. At two o'clock, a drachm of a watery extract of Meadow Narcissus, was applied to a wound inflicted in the inside of the thigh of a small dog. The animal died in the night, without any person being able to observe him. The mucous membrane of the stomach was filled with small spots of a cherry-red colour: the wound was not very much inflamed; the other organs presented no remarkable alteration.

Experiment 3rd. At nine in the morning, a wound was made in the inside of the thigh of a small dog, and a drachm and half of the same extract was applied; the lips were afterwards united by suture. At four o'clock the animal had not experienced any remarkable symptom. He died in the night. The lungs contained a little black blood; the mucous

* These spots ought to be considered as ecchymoses produced in the pulmonary organ, in consequence of a violent effort, which may have occasioned the rupture of some small vessels.

membrane of the stomach and that of the rectum, exhibited rings of a bright red colour: the limb, which was very little inflamed, was nevertheless the seat of a sanguineous infiltration sufficiently marked.

Experiment 4th. At eleven at night the same experiment was repeated, with forty-eight grains of the same poison, upon a robust dog of middle size. The animal vomited at the expiration of three quarters of an hour. Two days after, he was in good health, and made his escape.

Experiment 5th. Wishing to know what were the symptoms produced by the extract of Meadow Narcissus, when applied externally, the experiment was begun again at midnight upon a powerful dog, and a drachm of the extract was employed. The animal vomited six times during the night; he uttered some plaintive cries. At five in the morning, he was lying down on the side, in a state of great insensibility; his limbs, which were flabby, were not affected by any convulsive movement; the breathing was deep, and somewhat impeded. He died an hour after. The wound was very little inflamed; the mucous membrane of the stomach presented some reddish streaks; the intestinal canal was not the seat of any alteration; the lungs were grayish on the outside, reddish within, and contained a serous fluid in tolerable abundance; the heart was filled with coagulated blood.

824. It results from the foregoing experiments,

1st. That the extract of Meadow Narcissus produces a local irritation not very intense;

2nd. That it is quickly absorbed, and produces severe symptoms, followed by a speedy death;

3rd. That it is emetic.

4th. That it appears to act on the nervous system by destroying sensibility, and on the mucous membrane of the stomach; that its action is more energetic when applied to the cellular texture.

OF THE *ÆNANTHE CROCATA.*

825. This plant belongs to the *Umbelliferæ* of Jussieu, and the Pentandria Digynia of Lin.

Characters. Umbel large, having sometimes twenty-five, or thirty rays expanding, long; umbellula, with flowers nearly sessile; involucrum of five or six leaflets, somewhat elongated; involucellum of from six to eight white flowers; calyx of five fine teeth, persisting; corolla of five petals, curved in shape of a heart, larger at the edge of the circumference, (radiated). Fruit oblong, striated, surmounted by the teeth of the calyx and the styles: roots consisting of sessile tuberosities: stalk two feet high, thick, striated, erect, branchy, smooth, of a dirty green colour, full of a yellow juice: leaves bipinnated, with leaflets wedge-shaped, incised, trifid, smooth, similar to those of Parsley. This plant is found in ditches and fens.

Observations.

1st. On the 10th of April, 1677, a townsman of the Hague ate, with one of his friends, some roots of the Ænanthe. In a short time they both felt a great heat in the throat and stomach, which was followed by alienation of mind, vertigo, cardialgia, nausea, and diarrhœa. One of them had violent convulsions, the other bled at the nose; the one who had eaten the most, died at the end of two hours, the other at the end of three.*

2nd. Three French prisoners taking a walk in the neighbourhood of Pembroke, gathered and ate by mistake a small quantity of Ænanthe with some bread and butter. One of them in a short time experienced violent convulsions; he was bled, and died soon afterwards. The two others took their dinners, and were soon after attacked with convulsions; one

* Vanderwiel, *Observationum pariorum, &c.* tom. i. p. 182, *Leidæ*, 1727.

died, the other was cured by bleeding and a vomit, which he had great difficulty in swallowing. Several of their companions who had also eaten of this plant were vomited, and recovered: none of them experienced any comatose symptom.*

3rd. *Watson* relates, that a man swallowed by mistake a spoonful of the juice of *Ænanthe Crocata*, prepared from one single root. About an hour and half after, he experienced convulsions, and such a spasm of the jaw, that it was impossible to separate the inferior maxillary bone from the superior. He died three hours and a half from the ingestion of the poisonous substance. (*Philosophical Transactions, a further account*, p. 856, anno 1758.)

4th. *Allen*, in a work entitled *Synopsis Medicinæ*, makes mention of the poisoning of four persons by this plant.

5th. *M. Charles*, was called in to attend a whole family that had eaten some roots of Ænanthe. Momentary sensations of an acrid heat, determining to the head, a pungent burning in the epigastric region, and small rose-coloured spots, of an irregular shape, extending successively; such were the symptoms produced by the poison. These spots, which did not exceed the level of the skin, made their appearance at first on the face, then on the breast, and on the arms; the father alone had the belly swelled out like a balloon. Mucilaginous and oily medicines with milk, were administered to them.†

6th. The 15th Messidor, year 10, there were brought to the principal Naval Hospital at Brest, the dead bodies of three soldiers of the 82nd Demi-brigade. These unfortunate Belgians, deceived by the resemblance which the root of *Ænanthe Crocata* bore to one made use of in their own country, ate a great quantity of it. Its sweetish flavour pleased their palates, and contributed to the keeping up of

* *Philosophical Transactions, London*, anno 1746, p. 227, Extract of Mr. Howel's letter.

† *Annales Chimiques de Montpellier*, No. 134.

their error. They very soon experienced a general uneasiness, nauseas, vertigoes, and vomitings. To these succeeded most violent convulsions, and with such rapidity, that they sunk under them in less than an hour, and before any assistance was given.

Dissection. Nothing remarkable on the exterior surface of the body. One of these bodies was preserved for four days, and, at the end of that time, no sign of putrefaction was observed: the brain and its membranes were sound, the lungs distended, their vessels full of black and dissolved blood. In the bronchia, trachea, and mouth, was found a frothy and whitish fluid. The lungs in one of these bodies presented on their external surface some petechiæ; the cavities of the two circulatory systems empty; the heart sound. The stomach contracted, and inflamed in its extremity and its lesser curvature; its coats thickened: the intestines puffed up, and their vessels injected; the venous and arterial systems distended with a fluid of the same nature, dissolved and blackish: the derangements were precisely the same in all the three.*

It is perfectly ascertained, that the plant of which we have just given the history, is the *Ænanthe Cicutæ Facie* of *Lobelius (vide Lobelii Adversaria,* published in 1572); and *Wepfer* is mistaken in confounding it with hemlock, as he has done in his work, p. 15. *Historia Cicutæ Aquaticæ.*

826. These observations prove, that the *Ænanthe Crocata* exerts an energetic local irritation, and that it acts powerfully on the nervous system.

Vacher relates, that seventeen soldiers ate of the root of *Ænanthe Fistulosa.* Three of them died; the rest were saved by vomiting. (*Act. Helvet.* vol iv.)

We read in the *Journal de Médecine,* tom. x. year 1758, that six and thirty soldiers were poisoned by this root. One died; the rest were restored by vomits.

* Duval *Dissertation Inaugurale, supra citat.* tom. i. p. 23.

OF THE *GRATIOLA* (HEDGE HYSSOP).

827. The Hedge-Hyssop *(Gratiola Officinalis)* belongs to the family of the *Scrophulariæ*,* and to the Diandria Monogynia.

Characters. Calyx of five equal divisions, furnished with two bracteæ at its base: corolla monopetalous, tubular, of a yellowish white colour, irregular, having the border divided into four segments; the superior ones emarginate, the three others even: two fertile stamina, two barren filaments, and the rudiment of a fifth, at the bottom of the corolla: superior germen, conical, bearing an awl-shaped style with a stigma of two divisions. The fruit is an ovoid capsule, pointed, bilocular, bivalve, containing small and numerous seeds: stalk three decimetres in height, straight, cylindrical, furnished with leaves throughout its whole length, and mostly simple: leaves opposite, sessile, oval, lanceolated, indented towards their summit; smooth, shining, and marked by three longitudinal ridges: flowers axillary, single, pedunculated. It is found in fens, by the sides of ponds, and in the moist parts of woods.

ACTION OF HEDGE-HYSSOP ON THE ANIMAL ECONOMY.

Experiment 1st. At a quarter past ten, three drachms and a half of watery extract of Hedge-Hyssop, were introduced into the stomach of a small strong dog, and the œsophagus was tied. At eight in the evening, the animal had not exhibited any remarkable phenomenon. The next day, at ten in the morning, he uttered plaintive cries: he was lying down on the side, and expired an hour after: his breathing had not been impeded. The mucous membrane of the stomach ex-

* Natural Order, *Personatæ*.—TRANSLATOR.

hibited, throughout its whole extent, a cherry-red colour: it was black wherever it forms the folds observed in the interior of this viscus; it was easy to be assured that this last alteration was the consequence of a certain quantity of black extravasated blood within the space which separates it from the subjacent muscular coat. This last was nearly in its natural state; the interior of the rectum was evidently inflamed: all the remaining portion of the alimentary canal was a little red. The lungs did not appear affected; there was no serosity in the ventricles of the brain: the exterior cerebral veins were distended with black blood. The pia mater was injected, and of a vermillion red colour.

Experiment 2nd. This experiment was repeated with three drachms of the same poisonous substance. The animal died twelve hours after, in the night. The mucous membrane of the stomach was of a bright red throughout its whole extent; the intestines and lungs did not appear to be injured.

Experiment 3rd. An incision was made at noon, in the inside of the thigh of a dog of middle size; three drachms of a watery extract of Hedge-Hyssop, were applied to the wound, and the lips were united by suture. Half an hour afterwards, the animal had suffered nothing; he was just the same at six in the evening. The next day, at one o'clock, he was found dead. The body was still warm, the wound was pretty much inflamed; the limb operated on exhibited throughout its whole extent, a serous bloody infiltration. The stomach was only very slightly red, and contained food. There was no alteration in the intestinal canal: the lungs appeared sound.

Experiment 4th. The same experiment was repeated at half past ten in the evening. The next morning, at six o'clock, the animal appeared not yet to feel any inconvenience. At ten, he vomited, and attempted to bite when he was shaken. At one he was lying upon the side, in a slight degree of dejection. When placed upon his feet, he did not change his

position; nevertheless he preserved the free use of his senses and movements: he uttered no plaintive cry. At half past three, he was dying; he lay on the side without being any longer capable of motion: he was displaced without offering the slightest resistance; he yet preserved some degree of sensibility; for he then uttered some weak cries, and stretched out a little his paws: he could scarcely see, so that it was necessary to bring the objects very close to him, to make him turn away his head; his breathing was very slow; the beating of the heart could no longer be felt; there was no convulsive movement. Ten minutes after, he expired. He was instantly opened. The heart was beating very feebly, and ceased to move a minute after. The blood was fluid, and of a tolerably bright red in the aortic cavities, the lungs in their natural state, the stomach sound and empty; the rectum presented here and there some reddish spots; the wound was very much inflamed, without any eschar; the limb operated on, and all the corresponding side of the body, were infiltrated.

Experiment 5th. Twenty grains of the same extract dissolved in five drachms of distilled water, were injected into the jugular vein of a robust dog of middle size. At the end of six minutes, the animal began to make efforts to vomit, which were often repeated during a quarter of an hour. Twenty-eight minutes after the injection he had two stools; the next day, he had no appearance of being ill.

Experiment 6th. Twenty-eight grains of the same poisonous substance, dissolved in four drachms of water, were injected into the jugular vein of another robust dog of middle size. An hour after, the animal had a stool; he experienced some giddiness, and became as it were insensible, lay down, and expired two hours after the injection. It was impossible to discover the least trace of alteration in the texture of the digestive canal.

Buchner, Blair, Boerhaave, &c. have frequently seen serious accidents produced by this plant.

828. We are of opinion, that it may be concluded from the foregoing experiments,

1st. That an extract of Hedge-Hyssop produces a local irritation extremely violent;

2nd. That it appears not to be absorbed, and that its effects depend on the sympathetic lesion of the nervous system;

3rd. That it is much more active when injected into the veins.

OF THE *JATROPHA CURCAS* (INDIAN NUT.)

829. This plant belongs to the family of the *Tithymaloides* of Jus. and the Monœcia Monadelphia of Lin.

Characters of the fruit. It is first green, afterwards yellow, lastly black, nearly of the shape and size of a young walnut, and contains under a bark, that is thick, leathery, shrivelled, and smooth, three shells whitish, bivalve, and of one seed each. The seeds are oval, oblong, convex without, obscurely angular on the inside, almost cylindrical, and surrounded by two coats, proper, of which the external one is crustaceous, brittle, and blackish. Pressure alone of the kernel between the fingers, causes an oily matter to pass out. This species grows in the hot parts of America.

ACTION OF THE *JATROPHA CURCAS* ON THE ANIMAL ECONOMY.

Experiment 1st. At eight in the morning, three drachms of this seed, deprived of its ligneous covering, and reduced to a paste, were introduced into the stomach of a robust dog of middle size, and the œsophagus was tied. At a quarter before nine, the animal began to make efforts to vomit. At nine, he uttered some plaintive cries. At ten, he could no longer walk; he remained lying on the side, in a state of great insensibility. He died an hour after. He was opened

at two o'clock. The whole of the digestive canal was red on its external surface; the mucous membrane of the stomach was of a deep cherry-red throughout its whole extent; the interior of the rectum was of a fiery red; the lungs were crepitating, and of a reddish colour; the ventricles of the heart contained black fluid blood.

Experiment 2nd. At eight in the morning, this experiment was repeated with a drachm of the same paste. The animal only felt during the day, inclinations to vomit. At ten in the evening he was insensible, could no longer stand, and made deep inspirations. He died in the night. The digestive canal was very much inflamed in the interior and exterior: the coats of the great intestines presented, throughout their whole thickness, a colour which appeared black; in separating them from one another, it was perceived that this colour was an extremely deep red: there was no eschar. The lungs presented several livid patches, dense, and distended with blood.

Experiment 3rd. Another animal, that had taken a drachm and half of the same paste, died at the end of ten hours, and the same symptoms and appearances on dissection were observed.

Experiment 4th. At eight in the morning, a drachm of the same paste, mixed with two drachms of water, was applied to the cellular texture of the thigh of a dog. The animal experienced no remarkable phenomenon during the day. The next day at noon, he was lying upon the side; his breathing was difficult and profound. He was placed on his feet, and fell down like a lifeless mass; his limbs, far from being stiff, were extremely relaxed; the organs of sense no longer performed their functions. He died two hours after. The digestive canal was sound; the lungs presented livid, dense patches, distended with blood; the limb operated on was very much inflamed; the redness extended to the fifth sternal rib. There was no eschar.

830. It results from these facts,

1st. That the seed of the *Jatropha Curcas* possesses poisonous properties that are extremely energetic;

2nd. That it appears not to be absorbed; and that its fatal effects depend on the violent inflammation it produces, and on its sympathetic action on the nervous system;

3rd. That it acts more strongly when introduced into the stomach, than when applied to the cellular texture;

The fresh root, or the juice of the *Jatropha Manihot* produces swelling of the body, nausea, vomitings, pains of the stomach, evacuations, tenesmus, vertigo, pains of the head, loss of sight, coldness of the extremities, faintings, abolition of the vital powers, and death. (Piso, *Hist. Natur.* l. iii. c. 17.)

Similar phenomena are produced by the seeds of the *Jatropha Multifida*.

OF THE SQUILL (*SCILLA MARITIMA*).

831. The Squill belongs to the family of the *Liliaceæ* of Jus. and the Hexandria Monogynia of Lin.

Characters of the onion of Squill. Large bulb, composed of several coats, which are thick, fleshy, white, or reddish, according to the varieties; frequently as big as a child's head, smooth, oval, viscous, furnished underneath with a great number of fleshy fibres. This onion possesses an acrid and bitter taste, which attaches itself to the tongue, and is perceived for a long time: it exhales a subtle, strong, acrid, and penetrating smell, like that of horse-radish. This plant is very common on the coast of Barbary.

ACTION OF SQUILL UPON THE ANIMAL ECONOMY.

Experiment 1st. At nine in the morning, two ounces and

a half of the onion of Squill whole, partly in the shape of pulp, and partly liquid, were introduced into the stomach of a small robust dog, and the œsophagus was tied. Twenty minutes after, the animal made violent efforts to vomit, which were frequently repeated during the half hour that followed, and he uttered some complaints. At half past ten, he was found dead. He was opened at eleven: the heart no longer contracted; it was filled with blackish and coagulated blood: the lungs were of a rose colour, and crepitating: the digestive canal was not the seat of any sensible alteration.

Experiment 2nd. At eight in the morning, the same experiment was begun upon a small dog. Fifty minutes after, the animal began to make efforts to vomit, and continued them for ten minutes; then the pulsations of the heart became frequent, regular, and tolerably strong; the breathing deep, and somewhat accelerated; the pupils were very little dilated, and the countenance expressed astonishment. The animal felt no giddiness, nor was he agitated with any convulsive motion; when threatened by any one, he endeavoured to bite. At twenty minutes after nine, his breathing became much more accelerated and laborious; the organs of sense and motion performed their functions freely. A quarter of an hour after, he lay down upon the belly, having a slight tendency to drowsiness; there flowed from his mouth a small quantity of a bloody serosity. At forty-eight minutes after nine, he was shook; he again attempted to bite, rose up, and ran over the laboratory; but his step was rather slow: he then lay down again, and exhibited a slight convulsive trembling of the fore feet, which only continued a few seconds. At ten, the respiration was much less accelerated, and nothing could have excited a suspicion that the animal was near dying. All at once he uttered plaintive cries; rose up: the breathing again became hurried, and he fell down on the side; the head was bent backwards upon the back, and the limbs were greatly agitated, and extremely stiff. One minute after, his cries

ceased, the limbs became relaxed, and he only lived three minutes, during which time slight convulsive motions in different parts of the body were observed. The dissection of the body took place immediately. The heart was distended, and only contracted when touched with the point of the scalpel; the blood which it contained was fluid; that contained in the aortic cavities, exhibited a red colour, rather less bright than ordinarily. The lungs were rose-coloured, and nearly in their natural state; the digestive canal presented no alteration.

Experiment 3rd. At seven in the evening, an incision was made in the inside of the thigh of a dog of middle size, and two drachms of powder of Squill were introduced into the wound: the lips were then united by suture. A few minutes after, the animal uttered some plaintive cries. The next morning at six o'clock, he was found dead. The body was cold and stiff; the wound very little inflamed: the lungs were livid, distended with blood, and little crepitating; the digestive canal presented no alteration.

Experiment 4th. At eight in the morning, thirty-six grains of the powder of Squills mixed with a drachm of water, were applied to the cellular texture of the thigh of a dog of middle size, tolerably robust. At eleven, the animal did not appear to suffer any inconvenience; and was still the same at four. At midnight, he had an attack in every respect similar to that described in experiment 2nd, and died. The limb operated on was very much inflamed; there was no remarkable lesion in the interior organs.

Plenck makes mention of a child which had convulsions in consequence of taking some Squill.

832. We are of opinion, that we may conclude from the preceding facts,

1st. That the fatal effects of Squill depend chiefly on its absorption, and the action it exerts on the nervous system;

2nd. That the lungs do not exhibit any organic lesion, and

that the acceleration of the respiration appears to depend on the nervous influence ;

3rd. That it nevertheless produces a local irritation by so much the more energetic, as death is the longer in taking place.

4th. That it excites more frequently nausea and vomitings.

OF THE *SEDUM ACRE* (HOUSE-LEEK.)

833. This plant belongs to the Decandria Pentagynia of Lin. and to the family of the *Joubarbes* of Jus.

Characters. Calyx of five oval leaflets, corolla of five petals yellow and lanceolated ; five nectariferous scales at the base of the germ : five capsules. Stalks low, erect, somewhat flexuous, tender, and covered with leaves throughout their whole length ; its leaves are almost oval, short, not very thick, but fleshy, pointed, and triangular, sessile, of a yellowish green colour, which becomes red when they grow old, greasy to the touch, rising around the stalk in the form of spirals composed of five leaves, in such manner that the fifth rises immediately above the first, and that the stalk, which they cover completely, appears cylindrical ; there are from two to four sessile flowers upon the bifurcations of the stalk.

ACTION OF HOUSE-LEEK ON THE ANIMAL ECONOMY.

Experiment 1st. At eight in the morning, four ounces and a half of the juice of this plant, were introduced into the stomach of a tolerably strong dog, and the œsophagus was tied. The animal made efforts to vomit at the expiration of half an hour. In the evening, he was dejected, and preserved the free use of his senses and motions. He died in the night.

Dissection. The mucous membrane of the stomach was of a fiery red in that half of it next the pylorus ; the intestinal

canal appeared sound; the lungs were of a reddish colour, and somewhat more dense than in their natural state.

Experiment 2nd. The same experiment was begun again at six in the evening. The next day, at noon, the animal was lying down on the side, in a state of insensibility: he might be shaken in any manner like an inert mass of matter: the legs were affected with slight convulsive motions; the organs of sense and hearing possessed no sensibility. He died at three o'clock. The phenomena observed on dissection were just the same as in the preceding experiment.

We are of opinion that it may be concluded, that the juice of House-Leek produces a local irritation of some degree of violence, and that death depends on the consecutive lesion of the nervous system.

OF THE MEADOW RANUNCULUS (*RANUNCULUS ACRIS*).

834. This plant belongs to the family of the *Ranunculaceæ* of Jus. and to the Polyandria Polygynia of Lin.

Characters. Calyx of five leaflets, oval, broad, obtuse, smooth, coloured, and caducous: corolla of five petals, shining, oval, enlarged, and rounded at their summits, the claws of which are furnished at their base with a glandular depression, or a short small membrane: a great number of stamina, the filaments of which are shorter than the corolla. The fruits are smooth, compressed, of a brown colour, oval, sharp, terminated by the style, which is permanent, curved, and preserves for a long time its yellow colour: roots fibrous, almost fasciculated, from which arise a few straight stalks, eight or ten inches, or more, in height, hollow, very little hairy, not striated, moderately branchy. The radical leaves are petiolated, sometimes spotted, divided into three or five principal lobes, sub-divided into several others much less deep, oval or linear, incised and indented at their summit, almost

smooth, supported by smooth petioles, not striated, compressed. The superior leaves are less compound, fingered, or divided into five or three threads, straight, entire, sessile. This plant is every where found in the meadows, pasture grounds, and fields.

ACTION OF THE MEADOW RANUNCULUS ON THE ANIMAL ECONOMY.

Experiment 1st. Five ounces of the juice of this Ranunculus, prepared by triturating the leaves with two ounces of water, were introduced into the stomach of a small robust dog. The œsophagus was then tied. An hour afterwards, the animal made efforts to vomit, and moaned. He died at the end of twelve hours, and had exhibited no other phenomenon than a state of great dejection and insensibility. The mucous membrane of the stomach presented here and there patches of a lively red: the other portions of the digestive canal were in the natural state; the lungs contained a great quantity of fluid blood, and exhibited several patches which were livid, and of a dense texture.

Experiment 2nd. At eight in the morning, two drachms of a watery extract of the same plant, prepared by decoction, were applied to the cellular texture of the inside of the thigh of a strong dog. In the course of the day the animal experienced nothing but dejection. He died at ten at night. The limb operated on was tumefied, infiltrated, and very much inflamed; the inflammation extended to the muscles of the abdomen; the heart contained coagulated blood; the lungs were reddish, and distended with blood; the digestive canal was not affected with any sensible injury.

This species of Ranunculus, when applied to the temples, has produced pains, an intolerable heat, and fainting; when applied to the joints, it has stiffened them; it has almost always occasioned ulcers, and other disagreeable symptoms.

Ranunculus Sceleratus. *Plenck* relates, that the juice of this plant, administered to a dog, produced anxiety, vomitings, contortions, and great restlessness; these symptoms were succeeded by a speedy death. The interior of the stomach was red, and corroded in some points; the pylorus was tumefied, and of a livid red.

Beggars have been known to apply this plant to some parts of the body, in order to excite commiseration by the ulcers and pains it occasions.

Krapf has made experiments on himself and on dogs, in order to assure himself of the effects of this species of Ranunculus: 1st, he experienced extremely severe pains, and convulsive movements in the interior of the abdomen, in consequence of having swallowed a single flower which he had well pounded. 2nd. Two drops of the expressed juice of this plant occasioned, beside the above mentioned symptoms, a burning and convulsive pain throughout the whole length of the œsophagus. 3rd. In another experiment, he chewed the thickest and most succulent leaves of this species of Ranunculus: his mouth was filled with saliva; the tongue became inflamed and excoriated; the nipples of his breasts were elevated, of a bright red colour, and chapped at the extremity; he could no longer distinguish tastes; his teeth, which were set on edge, experienced from time to time shooting pains; the gums were very red, and bled on the slightest touch.*

Ranunculus Flammula. *Murray* asserts, that a woman had a gangrene of the arm in consequence of having applied this plant close to the wrist: it made such havoc, that the tendons and bones were laid bare. (*App. Medicaminum,* vol. iii. p. 87.)

It is well known that whole flocks have perished from grazing, in the spring, in pastures where this plant was common.

* Krapf, *Experimenta de Ranunculosæ nonnullorum Venenatâ Qualitate, horumque Externo et Interno Usu.* Vindob. 1766.

The *Ranunculus Bulbosus, Ficaria, Thora, Arvensis, Alpestris, Polyanthemos, Illyricus, Gramineus, Asiaticus, Aquatilis, Platanifolius, Breynius,* and *Sardous,* are equally poisonous.

835. We are of opinion, that, from the foregoing facts, it may be concluded.

1st. That these different species of Ranunculus and their extracts, produce a severe inflammation of the texture to which they are applied ;

2nd. That the death resulting from them is the consequence of their sympathetic action on the nervous system ;

3rd. That they do not appear to us to be absorbed ;

836. There exists besides a sufficiently great number of vegetable poisons belonging to this class, which we shall examine succinctly : they are rarely used in medicine, and their effects are similar to those whose history we have just given.

1st. *Rhododendron Chrysanthum.* The decoction of this plant has a bitter burning taste : it is emetic, drastic, and inflames the texture to which it is applied. The *Rhododendron Ferrugineum,* according to *Welsch,* is equally poisonous. This author speaks of a meal which became fatal to the guests, for having eaten of a hare which had been fed on its leaves.

2nd. *Fritillaria Imperialis* (Imperial Crown). Several authors insist that this plant is exceedingly acrid. We have frequently given to dogs the bulb bruised : these animals did not die till after the expiration of thirty-six, forty-eight, and sixty hours ; and we were never able to discover the least trace of redness or inflammation in the digestive canal. These experiments were made in the month of June.

3rd. *Pedicularis Palustris. Gleditsch* and *Gunner* have remarked that this plant injures sheep and oxen. It has an acrid, burning taste.

4th. *Cyclamen Europœum. Boerhaave* has classed this vegetable amongst the acrid poisons, because it purges with

great violence in the dose of one drachm, and excites vomitings. The ointment prepared from it also produces the same evacuations when applied about the navel: its taste is acrid. *Bulliard* asserts, that the root of this plant produces frequently cold sweats accompanied with tingling in the ears, dizziness, and convulsive movements; the patient voids blood by vomiting and by stool: a super-purgation supervenes, which proves fatal. (*Op. citat.* p. 105.)

5th. *Plumbago Europæa.* *Sauvages* observes, that the workmen who make use of the decoction of this vegetable for the purpose of obtaining a yellow dye, are tormented by a severe head-ache, if they work longer than six hours. (*Nosologie*, tom. i. p. 842.) Its taste is acrid, almost caustic.

Seeds of *Cèvadille.* They possess an acrid taste, extremely bitter, and inflame the texture with which they come in contact.

7th. *Colchicum Autumnale.* The seed of this plant is deleterious, and a number of children have lost their lives in consequence of having eaten of it. The effects of the bulb have not yet been well ascertained. *Cratochwill* swallowed half an ounce of it, without feeling any more than a slight bitter taste in the mouth. *Stork* ate a whole bulb, and did not experience the slightest inconvenience. The illustrious *Haller* found neither flavour or acrimony in the bulbs of this plant gathered in the Autumn. On the other hand, observers worthy of confidence attest, that these bulbs, administered to animals, have produced retchings, vomitings, gripes, purging, inflammation of the stomach and intestines, and death. We have frequently given to dogs, in the month of June, two or three of these bulbs bruised, and have never perceived any sensible effects: which induces us to believe that the climate and season of the year, have great influence on their deleterious properties.

8th. *Convolvolus Scammonea (Scammony).* Several authors

assert, that the concrete juice of this root is poisonous. We have frequently administered four drachms of it to dogs, who had the œsophagus afterwards tied, and have only observed alvine evacuations. The animals died at the end of six or seven days, and some small ulcerations have been found in their stomachs. Now it will be found in the *Appendix* to this work, in speaking of the ligature of the œsophagus, that it is not uncommon to see that kind of lesion resulting from this operation.

9th. *Cerbera Ahovai.* It is asserted that the nut of the fruit of this plant is extremely deleterious. The wood, on being thrown into ponds, stupefies the fish. The fruit of the *Cerbera Manghas* is of an acrid and bitter taste ; it is emetic.

10th. *Cynanchum Erectum. Plenck* relates, that thirty-six grains of the leaves of this plant, administered to a dog, produced violent vomitings, a trembling, convulsions, and death. The *Cynanchum Vimiale* furnishes a milky juice extremely caustic.

11th. *Lobelia Syphilitica.* This plant has an acrid taste ; it is emetic and purgative. The *Lobelia Longiflora* possesses still more energetic properties : we call it in Spain *Rabienta Cavallos,* because it kills the horses. *Jacquin* says, that it produces a burning inflammation of the eyes if they are touched with its juice. (Histor. Americ. Stirp. p. 226.)

12th. The *Apocynum, Androsæmifolium, Cannabinum, Venetum,* furnish a milky juice of an acrid flavour, which inflames and ulcerates the skin.

13th. *Asclepias Gigantea. Bauchin* asserts, that the juice of this plant administered in the dose of a drachm and a half, has produced very grievous symptoms, and a fatal hæmorrhage. We have frequently administered to dogs the *Asclepias Vincetoxicum :* these animals died at the end of one or two days, and their stomach was found inflamed.

14th. *Hydrocotile Vulgaris.* This plant possesses an acrid taste, and appears to be hurtful.

15th. The *Clematites Vitalba, Flammula, Recta,* and *Integrifolia,* are acrid and caustic: when applied to the skin they produce redness, pustules, and excoriations: introduced into the stomach, they occasion an inflammation which destroys the animal.

16th. *Pastinaca Sativa Annosa.* The root of this plant has been known to produce delirium, vertigo, great heat at the stomach, in the mouth and eyes, and tumefaction of the lips. (*Murray,* Op. citat. vol. i. p. 285.)

17th. The *Sælanthus Quadragonus, Forskalii,* and *Glandulosus,* are extremely acrid, and pass for being poisonous.

18th. The juice of the *Phytolacea Decandra* in the adult state is acrid, and has been known to produce violent evacuations upwards and downwards.

19th. *Croton Tiglium.* The seeds of this plant possess an acrid, nauseous, and burning taste; they purge in the dose of one grain. *Plenck* asserts, that the oil expressed from their kernels is extremely sharp.

20th. The *Arum Maculatum, Dracunculus, Dracontium, Colocassia, Esculentum, Virginicum, Arborescens,* and *Seguinum* are equally acrid. *Stork, Haller, Stehelinus,* speak of serious effects produced by the infusion of the leaves of the *Arum Maculatum.* We have administered to dogs the fresh root of this plant: they died at the end of from twenty-four to thirty-six hours, without any other symptom than dejection; and the digestive canal was found somewhat inflamed.

Bulliard relates the following fact:

"Three woodman's children ate of the leaves of this plant: they were seized with horrible convulsions. Assistance was procured for them too late; it was impossible to make the two youngest swallow any thing; they were bled without success; glysters were given them, which produced no effect: they died, one at the expiration of twelve days, another, at the expiration of sixteen. The other child was still

able to swallow, although with considerable pain, because its tongue was so swelled that it filled the whole cavity of the mouth; but deglutition became free after being bled. The child was made to drink milk, warm water, and especially an abundance of oil of olives. A diarrhœa came on, which saved the child; it was pretty well restored in a short space of time, but always preserved a very great degree of leanness." (*Histoire des Plantes Vénéneuses de la France*, p. 84.)

21st. *Calla Palustris.* The root of this plant has a burning taste.

OF NITRATE OF POTASH.

887. The Nitrate of Potash, ranked by *M. Fodéré* in the class of acrid poisons, is a salt, the poisonous properties of which has long fixed the attention of judicious physicians. Some observations reported in works on the Materia Medica, and Medical Jurisprudence tended to prove, that the ingestion of this salt might prove fatal; the experiments, which we have tried on animals, leave no doubt on this head, and it is easy to prove that in the dose of two drachms, this salt produces serious symptoms, succeeded almost constantly by death, if not expelled by vomiting.

Experiment 1st. A robust dog was made to swallow five drachms and a half of pure Nitre, in fine powder. At the end of five minutes, he vomited twice some alimentary matter, mixed with a mucous and stringy fluid; the next day, he refused food. The day following, at eight in the morning, he ate well, and experienced no remarkable symptom. At three o'clock, there was introduced into his stomach an ounce and half of pure Nitre, dissolved in four ounces and a half of distilled water, and the œsophagus was tied. Two minutes after, the animal made some efforts to vomit, which were frequently repeated during the first ten minutes. At half past three, he experienced vertigoes; at four o'clock, he was

lying down on the side, and had slight convulsive motions of the right anterior extremity; the pupils were dilated, respiration slow and deep, the pulsations of the heart weak, and not very frequent; sensibility and mobility were diminished to such a degree, that the animal could not possibly support himself a moment on his feet; this state increased, and he died at half past four. He was instantly opened. The blood contained in the heart was fluid, and of a bright red colour in the aortic auricle; the lungs appeared as in their natural state; the stomach, which was livid on its exterior, was distended by a limpid fluid; the mucous membrane throughout its whole extent exhibited a blackish red colour; it was scattered over with vessels strongly distended with black blood; the muscular coat was of a bright red; the inflammation extended to the ileon.

Experiment 2nd. At eleven o'clock, there were introduced into the stomach of a small robust dog, two drachms of pure Nitre reduced to a very fine powder, and the œsophagus was tied. At the end of five minutes, the animal began to make efforts to vomit, which lasted for half an hour. At twelve, he uttered plaintive cries. At one, he had vertigoes. At half past two, the pains he suffered appeared excruciating; he was lying upon the belly, his hind legs widely separated, the anterior ones bent; he could no longer stand for a moment, and when he endeavoured to change his position, he made a start, and fell down again like a lifeless mass: the weakness of the posterior extremities increased more and more; he gave no sign of feeling when pinched; the organs of sense possessed all their integrity. The eye-lids, and anterior extremities, were agitated with slight convulsive movements; the inspirations were rare and deep; he died at ten minutes after three. The stomach contained a tolerably great quantity of a thick stringy fluid; the mucous membrane presented here and there, throughout its whole extent, a purple red colour, scattered over in some points with black spots; the subjacent coat was

of a bright red; the remaining portions of the digestive canal and the lungs, did not appear to be injured.

Experiment 3rd. The same experiment was repeated with a drachm of pure Nitre; the animal died at the end of twenty-nine hours, after having exhibited symptoms similar to those described in the two foregoing experiments. On opening the body, the mucous membrane of the stomach was found inflamed.

Experiment 4th. A wound was made on the back of a robust dog of middle size; it was sprinkled over with two drachms of Nitre in powder, to which were added an ounce and half of water saturated with this salt: the lips were united by suture. At the end of three days, the animal did not appear any way affected. A wound was then made in the inside of the thigh of another small dog, which was sprinkled with two drachms of pure Nitre dissolved in four drachms of water, at the temperature of 40°. At the end of five days the animal ate with a very strong appetite, and had experienced no other inconvenience than what arose from the wound. An incision was made near the femoro-tibial articulation of a small lean dog. Three drachms of Nitre moistened with a drachm of water, were introduced into the wound. Five days after, the animal ate with a very strong appetite, but the wound was very considerable; it had been in a state of gangrene, and extended to the umbilical region. This animal was neglected, and he died eight days after the operation. The stomach exhibited no sensible alteration; nor did any of the other organs.*

Observations.

1st. A man labouring under a periodical fever, took by

* In another experiment the animal died two days after the application of three drachms of Nitre upon a wound made in the inside of the thigh; and on opening the body, two small ulcers were found in the stomach; several points of the mucous membrane were black, and scarified, and

mistake an ounce and half of Nitrate of Potash. A short time afterwards, the most severe anguish, with a sense of internal cold, took place at the stomach. To this succeeded fainting and syncope; and in less than ten hours the patient expired. *(Comparetti.)*

2nd. " Six years ago the late M. M. Froissard and Martin begged of me to assist at the opening of the dead body of a female servant, who was suspected of having voluntarily poisoned herself. What supported this opinion was, that for the two or three months preceding, she had become low spirited and unhappy, in consequence of obstructions in the abdomen, and suppression of the menses. This young woman, who was thirty-six years of age, was of a robust habit, of a bilious and extremely irritable temperament. She had made use of different popular remedies, infused sometimes in wine, sometimes in brandy. Two days before her death, she had taken an ounce and half of some saline substance, which she could only designate by the name of salts: this purgative, taken in two glasses, at the distance of half an hour, procured her by vomiting and stools, very copious evacuations of degenerated bile, and caused very violent pains in the bowels. The physician who was called to quiet these severe irritations, produced by a superpurgation, ordered mucilaginous decoctions in drinks, and in glysters: he was obliged even, from the violence of the pains to give opium both in substance and tincture. These remedies were without effect: the patient felt a consuming fire, which she referred to the chest and the stomach; her extremities were cold; her pulse was almost nothing; at length she expired sixty hours after having taken the salt.

" The body was opened two hours after death.

" The stomach was red, scattered over with blackish spots

there was some extravasated blood within its proper texture; but we do not attach much importance to this fact, as it is *unique*, and we cannot affirm that the animal had not swallowed some other poisonous substance.

the size of a lentil; towards the bottom of it, one of these spots was as large as a farthing; in the centre was a small hole, which perforated the viscus; the intestinal canal was interiorly reddish; the liver was obstructed, and the uterus perfectly empty.

" We understood that this girl having occasion to take a purge, one of her acquaintances had bought for her at a druggist's an ounce and half of salt of Nitre (Nitrate of Potash)."*

3rd. *M. Laflize* relates the following fact:

" A lady whom he had been attending for an erysipelatous redness of the leg, having taken by his direction for the purpose of purging her, on the 27th of April, 1787, at six in the morning, an ounce of Nitrate of Potash as it comes out of the Saltpetre Manufactory, dissolved in a glass of water, with the addition of two ounces of syrup of apples, which salt was sold by a druggist in the room of Sedlitz salt (Sulphate of Magnesia), which had been prescribed; she experienced a quarter of an hour after, the following symptoms: cardialgia, nausea, painful vomitings, evacuations downwards, and afterwards convulsions which contorted the mouth, syncope; pulse extremely weak, extremities cold; afterwards no pulse, loss of voice, consuming heat in the stomach, cruel pains in the belly which nothing could quiet; presentiment of approaching dissolution, breathing laborious; died at nine in the morning, three hours after the fatal draught.

" On opening the body, the following appearances presented themselves: stomach greatly distended by a fluid; the external coat of this viscus was of a deep red colour; some brown spots were observed in it; its mucous coat was inflamed beyond measure, and was found detached in several places: the sanguineous humour, which had flowed from the

* *Journal de Médecine, de Chirurgie, et de Pharmacie*, tom. lxxiii. anno 1787. Observation of M. Souville.

ruptured vessels, had coloured with red the contained fluid, which amounted to a pint in measure. This gangrenous inflammation began at the cardiac orifice, and ended at the pylorus; the rest of the body was in its natural state.

" It was ascertained that the cause of her death was owing to the hypersthenic action of the Nitre, by examining some of this salt, which was immediately sent for from the same druggist; and by chemical analysis of the fluid contained in the stomach, which produced by evaporation crystals of real Nitrate of Potash."

4th. A grocer's wife of Edinburgh, two months advanced in pregnancy, swallowed by mistake a handful of Nitre. Instantly came on, sharp pains of the stomach, nausea, and vomiting of several mouthfuls having the taste of Nitre. A quarter of an hour after, the whole body was swelled. There were administered, ten minutes after, some ipecacuanha, and a saturated solution of Glauber salts. The woman aborted at the expiration of half an hour, and passed by stool a great quantity of blood mixed with detached portions of the mucous membrane of the intestines; the throat was excoriated, which circumstance could not allow the patient to swallow any thing pungent. Five days afterwards, the general pains, and different nervous symptoms began to yield to the use of milk, mucilaginous drinks, and opium. M. Alexander, who has related this case, does not say whether the patient was perfectly restored to health. (*Ancien Journal de Médecine*, tom. lxxi).*

* *M. Tourtelle*, physician at Besançon, doubts whether Nitre be a poison capable of producing death. According to him, it acts only in the manner of other neutral salts. In a strong dose however it produces some accidents, such as a painful sensation at the stomach, vertigoes, coldness of the extremities, and sometimes of the whole body, fainting, &c.

A man affected with ascites, took during three weeks, aperient ptisans, with Nitre in the dose of a drachm to the pint. As he was impatient to get well, and he had heard the Nitre extolled in his disease, he took of it

838. These facts enable us to conclude,

1st. That the Nitrate of Potash, introduced into the stomach of dogs and of men, acts in the same manner as acrid or corrosive poisons.

2nd. That it is capable of producing death when it is not vomited, and has been swallowed in the dose of two or three drachms.

3rd. That it appears to act immediately on the mucous texture of the digestive canal, and subsequently on the nervous system, after the manner of stupefying poisons.

4th. That it is not absorbed when applied to the cellular texture, and consequently that it is confined, in this case, to produce local effects.

5th. That we cannot admit the opinion of *M. Tourtelle*, physician of Besançon, who believes that this substance acts like the other neutral salts. (See the note, p. 89.)

CHEMICAL HISTORY OF NITRATE OF POTASH.

839. Nitrate of Potash is a salt of a white colour, and of a cool and pungent taste It crystallyzes in long prisms of six sides, and semitransparent, terminated by diedral tops. These crystals frequently adhere to each other in such a manner as to form flutings.

one day about two ounces in two glasses of water. He was indeed a little tormented with colics of the belly; but he was entirely cured by abundant evacuations, both by stool and urine. What is most remarkable, he experienced none of the symptoms of poisoning, although his stomach was so sensible, that it could not retain a spoonful of the weakest wine of squills.

M. Tourtelle attributes the symptoms described by *M. Laflize* to the violent action *(transports)* of the arthritic humour on the stomach of the patient, who was the subject of the other observation of *M. Laflize*. *(Journal de Médecine, Chirurgie, et Pharmacie*, tom. lxxiii. Reflexions par *Tourtelle*, p. 22. et suiv.)

840. It dissolves in four times its weight of water at 15 degrees; boiling water dissolves *four times* its weight.*

841. When thrown on burning coals, it makes them burn bright. (Vide vol. i. part ii. p. 330.)

842. Concentrated Sulphuric acid, poured upon this salt in powder, decomposes it at the ordinary temperature, and disengages vapours of Nitric acid, which are white, and not very abundant.

843. Muriate of Platina produces, in the concentrated solution of Nitrate of Potash, a precipitate of a canary yellow. (§ 623. vol. i. part ii.)

844. Lime in powder produces no sensible phenomenon on being mixed with this salt.

845. The Hydro-sulphurets do not precipitate it.

OF OXYGENATED MURIATIC GAS *(CHLORINE).*

846. This gas, which is now considered to be a simple substance by the most celebrated chemists, is called *Chlorine*, on account of its greenish yellow colour. It possesses a disagreeable taste, and an odour so suffocating, that it is impossible to respire it, even when mixed with the atmosphere, without experiencing a sensation of strangulation, and a tightness of the chest. Its specific gravity, 2,470. Far from reddening the infusion of tournesol, like the acids, it destroys it by turning it yellow.

847. When exposed to the action of caloric, the gaseous Chlorine experiences no alteration when it has been previously dried; if a mixture consisting of equal parts of Chlorine and hydrogen in a gaseous state, be introduced into a flask full of water, and inflamed, by means of a lighted taper, there takes

* This is evidently an error, perhaps from inadvertence; the quantity of Nitre which boiling water is capable of dissolving, being about its own weight.—TRANSLATOR.

place instantly a detonation, and formation of hydro-chloric (muriatic) gas, which appears in the form of white vapours.

848. Solid phosphorus, arsenic, tin, and pulverized antimony, combine rapidly, and at the ordinary temperature with Chlorine, when plunged into a flask filled with this gas. Solid Chlorurets *(Chlorures)* are constantly obtained, and there is a disengagement of caloric and of light: this last phenomenon is owing to the passage of the Chlorine from the gaseous to the solid state.

849. Chlorine dissolves in water, and forms liquid Chlorine. Being mixed with hydro-sulphuric gas (sulphurated hydrogen) it becomes decomposed, seizes upon its hydrogen, in order to pass into the state of hydro-chloric acid, and the sulphur is set at liberty.

ACTION OF GASEOUS CHLORINE ON THE ANIMAL ECONOMY.

M. Nyston, who published in 1811 a very beautiful work on the injection of gases, into the veins, arteries, pleura, &c. made some experiments upon Chlorine, which we have repeated, and which we have found to be extremely correct.

Experiment 1st. Ten or twelve centimetre cubes of gaseous Chlorine, were injected into the jugular vein of a dog of middle size, at the temperature of 9°. R. The effects of this injection were confined to a little moaning. At the expiration of five minutes, a fresh injection was made of twenty centimetre cubes of the same gas: at the end of one minute, the animal uttered some cries, indicative of suffering; the breathing became difficult and rare, and he died three minutes after the last injection. On opening the body, which was done four minutes after death, blood was found entirely fluid, and similar to venous blood in the pulmonary auricle and ventricle, which contained neither gas, nor coagulum.

Experiment 2nd. At forty-five minutes past eight, there

were injected into the right pleura of a dog of six *kilograms* in weight, sixty centimetre cubes of gaseous Chlorine at the temperature of 13°. R. Immediately after, violent agitation, and discharge of urine took place; the animal fell down on his side, stretched himself out a moment, and gave a shriek, as if in extreme pain. Shortly after, he walked about; but continued to complain. At twelve o'clock, he complained no longer; was for the most part lying down. At fifteen minutes after four, he had a trembling of the limbs; no moaning. The next day, he was melancholy, and remained lying down. The third day, he was killed. Both pleuras were covered by a false membrane, and contained each about a hundred *grains* of a reddish serosity. By growing cold there formed in the heart concretions apparently gelatinous, similar to those observed as resulting from inflammatory diseases, and which have a great analogy to the pleuritic crust.*

It is known by a great number of experiments, that animals quickly perish when plunged into the gaseous Chlorine. *M. Nysten* says on this subject: "This gas is not absorbed when respired pure; it appears to act only by irritating the bronchia locally, and its action is so energetic, that the animal dies before becoming asphyxied by the black blood. What proves beside, that it acts only by irritating, is, that when it is respired diffused in the atmosphere in too small quantity to destroy life in the lungs, it confines its action to the producing a cough more or less severe, and sometimes, as it has been observed by Fourcroy, a phlegmasia of the mucous membrane of the bronchia." (*Recherches de Physiologie et de Chimie*, p. 144, anno 1811.)

* (*Couenne Pleurétique*) the buff coat observed on the blood after venæsection.—TRANSLATOR.

ACTION OF THE FLUID CHLORINE ON THE ANIMAL ECONOMY.

Experiment 1st. At nine o'clock, five ounces of solution of Chlorine moderately concentrated, were introduced into the stomach of a small strong dog, and the œsophagus was tied. Ten minutes after, the animal began to make violent efforts to vomit. At twelve o'clock, he was very much dejected, and complained greatly. He died in the night. The mucous membrane of the stomach was of a black red throughout the whole of its extent: the other organs appeared sound.

Experiment 2nd. The same experiment was repeated with two ounces of the above solution, which had previously been weakened by four ounces of water. The animal died in a state of dejection, four days after the ingestion of the poisonous substance. The mucous membrane of the stomach, which was not very red, exhibited towards the great extremity a few small ulcers surrounded with a yellow areola. The interior of the duodenum and of part of the jejunum, were lined with a yellow coat of tolerable thickness, proceeding without doubt from the decomposition of the bile, by the hydro-chloric acid formed at the expense of the Chlorine, and of the hydrogen of the organic texture.

Experiment 3rd. *Javel* water, into which Chlorine enters, produced an action upon animals similar to that we have just described.

850. These facts prove that the fluid Chlorine, acts in a manner similar to that of the mineral acids of which we have already spoken, vol. i. part ii.

OF NITROUS ACID GAS.

851. The Nitrous Acid Gas is of an orange yellow colour; it has a strong smell, extremely disagreeable; its taste is acrid

and caustic; it reddens the infusion of tournesol, dissolves rapidly in water, and attacks mercury. Its action on the metals, and on organized substances, is in general stronger than that of the Nitric Acid. These characters are sufficient for distinguishing this gas from every other production, natural or artificial.

ACTION OF NITROUS GAS ON THE ANIMAL ECONOMY.

Observation.

1st. A man, about forty-five years of age, of a tolerably strong constitution, but subject to an habitual oppression, followed, for several years, the dealing in *Aqua Fortis*. In the month of May, 1804, the heat was considerable, and the thermometer had ascended as high as 26°: he was awoke one morning, at four o'clock, by the howlings of a great watch dog, which he had shut up in his warehouse. He immediately went down stairs, accompanied by a neighbour, opened the door, and was struck instantly by the smell of Nitrous Gas which he perceived.* The dog rushed out precipitately, having his feet burnt, and ran to the nearest stream to quench his thirst; he played with some other dogs in the neighbourhood, and returning two hours afterwards, died at the door of his master, vomiting thick matter of different colours. The master however penetrated notwithstanding into the warehouse in order to set open the windows; but he had scarcely remained there five minutes, when he was obliged to return, being threatened with suffocation: he went in again

* *M. Degranges*, who is the author of this observation, and all who have copied it, have attributed this poisoning to the Nitrous gas; but it will be sufficient to recollect that this gas cannot remain an instant in contact with the atmospheric air, without carrying off its oxygen, and converting it into Nitrous Acid Gas, in order to be convinced that it is the acid gas which has occasioned the symptoms reported in this observation.

however in a short time after, and brought out the case containing the broken bottles. About six o'clock, he went to take a little milk in a coffee-house, and then drank half a bottle of wine, and after taking a little turn in the town, returned home before eight o'clock, complaining of great debility, of a dry and acrid heat in the throat, irritation of the stomach and breast, and a sense of constriction in the epigastrium : his habitual difficulty of breathing had not increased in proportion. He was advised to drink copiously of milk. His physician, who arrived soon after, approved of this beverage, and prescribed besides fomentation to the abdomen, and the application of mustard to the arms. These two means appeared to be excessively fatiguing to the patient, and increased his anguish : he continued only the milk, and towards one o'clock affirmed that he suffered less. He then passed spontaneously a yellowish stool, and, in the space of an hour, two more, all of which were of a citron colour; the urine was scanty, and towards evening the patient was tormented by frequent and fruitless desires to make water. At four o'clock, he began to expectorate a yellowish matter, which excited some hope; he resumed the employment of the milk, which he had discontinued for some hours, and alternated it with *orgeat:* he had afterwards a little cough, some nausea, and a slight vomiting. Some glysters were given him, which were instantly returned, and yet were tinged with yellow. At nine in the evening, the patient's face became bluish, and his breast embarrassed, with some degree of rattling; some hiccup was observed, and considerable pains were felt in the region of the diaphragm; there were likewise some convulsive movements and slight delirium. Towards morning the anxiety increased, the anguish became inexpressible ; the patient however drank some milk at five and at six o'clock, preserving all his senses. At seven he was no more. Shortly after death, his belly swelled, and became distended in a very remarkable manner; his face became purple, his lips black, and a few drops of blood flowed

from the nose and from the mouth. The body was not opened.*

M. Nysten, who has made a great number of experiments on the Nitrous Gas, is convinced that it produces death in a very short time, and that it turns the blood brown. The Nitrous Acid Gas, of which we have given the history, and which is composed of Nitrous Gas, with the addition of oxygen, appears to us to act, 1st, by irritating strongly the bronchia, and small pulmonary vessels; 2nd, in causing the blood to undergo an alteration similar to that of the Nitrous Gas.

852. The fluid Nitrous Acid, exerts on our texture the same action as that we have described under the Article *Nitric Acid,* (Aquafortis) vol. i. p. 2.

OF SULPHUREOUS ACID GAS.

853. The Sulphureous Acid Gas is constantly disengaged whenever sulphur is burnt in the open air, or in oxygen gas; it is recognized by the following properties. 1st. It is colourless; 2nd, it has a pungent smell, which is the same as that of burning sulphur; 3rd, it reddens the tincture of tournesol, which it changes in the end to a straw yellow; 4th, it is very soluble in water.

854. According to *M. Hallé,* it kills Guinea-pigs who respire it, in less than a minute and a quarter. Its effects depend upon the irritation it produces in the lungs.

855. After having explained in detail, the phenomena produced by this class of poisons, we shall proceed to point out in a general way, the symptoms and lesions of texture to which they give rise: by these means we may be able to establish some general data, with respect to their mode of action, and the mode of treatment necessary to adopt in order to counteract their effects.

* *Dictionnaire des Sciences Medicales,* tom. ii. p. 388.

SYMPTOMS PRODUCED BY THE ACRID POISONS.

856. A short time after the administration of these poisons, there is felt an acrid, pungent taste, more or less bitter, a burning heat, and considerable dryness in the tongue, and in every other part of the mouth, and a constriction, more or less painful, in the throat. Shortly after, acute pains begin to be felt in the stomach and bowels, which are quickly followed by nausea and copious evacuations upward and downward. These evacuations sometimes take place without effort; but more frequently they are excessively painful, and the animals strain to provoke them, when the digestive canal has been completely emptied. The pulse and beatings of the heart are strong, frequent, and sufficiently regular; respiration is somewhat accelerated, and no remarkable change can be perceived in the manner in which their sensations and motions are executed. A few hours after, phenomena are observed, which announce a lesion of the nervous system. The animals are almost in every instance affected by vertigoes, they begin to stagger, their pupils become dilated, they fall into a state of great insensibility, respiration and the circulation begin to fail, and they expire without uttering the least complaint. Sometimes they experience convulsions more or less violent, their limbs become stiff, they utter plaintive cries, and expire.

LESIONS OF TEXTURE PRODUCED BY THE ACRID POISONS.

857. When poisonous substances of this class have been introduced into the stomach, in a dose sufficiently strong to kill the animals, alterations, more or less considerable, are discovered, the intensity of which depends in general on the nature of the poison ingested, and the period at which the animals have fallen victims to it.

1st. The different parts of the mouth, œsophagus, stomach, and intestinal canal are inflamed; sometimes the mucous membrane only presents, throughout its whole extent, a fiery red colour; sometimes this colour is of a cherry, or of a blackish red; in that case it is not uncommon to see the muscular and serous coats partake of this inflammation, and a number more or less considerable of black spots resembling sloughs, or longitudinal zones of a deep red colour, are discovered, which depend on the extravasation of black blood between the coats, or in the chorion of the mucous membrane. Sometimes small ulcers are found near the pylorus; but most frequently the inflammation confines itself to the fauces, stomach, and great intestines, which phenomenon appears to arise from this cause, that the poison has been longer in contact with these parts than with the others. It is easy to perceive, that the lesions we have just described have the greatest analogy to those produced by the corrosive poisons (vol. i.). In fact, we do not hesitate to declare, that there exists a perfect identity between the alterations of the digestive canal produced by the poisons of these two classes when introduced into the stomach.

2nd. The lungs exhibit very commonly lesions more or less considerable; their colour is sometimes violet; but in general it is a deeper red than in the natural state. Their texture is more tight, dense, distended with blood, and less crepitating, at least some parts of them: it is not uncommon to find in them a bloody serosity. These phenomena may arise from the repeated and fruitless efforts to vomit; we are of opinion however, that they are frequently the result of a special action of the poisonous substance upon the lungs: the hellebore seems to us to be principally in point.

3rd. The ventricles and auricles of the heart, are more or less distended by blood differently coloured, according to the period at which the dissection takes place. In a number of circumstances, this fluid is found coagulated one or two hours

after death, and it is almost constantly in this state at the end of fifteen or eighteen hours. This pathological fact, of which we warrant the correctness, is far from confirming the opinion advanced by some authors, that in poisoning by vegetable substances the blood remains fluid for a long time. In truth, they have principally wished to speak of narcotic substances; but we shall see, when giving the history of these poisons, that their assertion is totally void of foundation.

4th. The brain and its meninges exhibit no notable lesion in cases of poisoning by acrid substances; nevertheless, a fulness of the veins creeping over the external surface of this viscus, is sometimes observed.

5th. The other organs have not appeared to us to undergo any sensible alteration from poisonous substances of this class.

858. When applied to the surface of the skin, or the cellular texture, these poisons produce the local phenomena which we have described (page 1, of this volume); and when death takes place, the lesions we have enumerated, are found, excepting that the digestive canal is seldom affected.

859. It results from the foregoing considerations: 1st, that, in a case of poisoning, the juridical physician will be often greatly embarrassed to determine, from the simple *lesion of the internal organs*, whether the poison ingested belong to the class of acrid, or to that of corrosive poisons; 2nd, that, in the case where chemical analysis shall have proved that the poisoning has not been produced by one of the corrosive poisons, and that every thing favours the belief of its belonging to the class of *acrid poisons*, it will be impossible to decide, by the simple *examination of lesions on dissection*, what is the poison that has produced them, these lesions being pretty nearly the same in all; 3rd, in fine, that, taking into consideration the symptoms, and especially the intense inflammations produced by acrid substances, we cannot confound the poisoning produced by them, with that which

results from the narcotic, or even by the narcotico-acrid, poisons, which either do not inflame the texture of the organs, or produce only a very slight inflammation.

GENERAL ACTION OF ACRID SUBSTANCES ON THE ANIMAL ECONOMY.

860. It seems natural to pass to general considerations on the mode of action of the poisons contained in each class, after having given their particular histories in distinct sections, and described the lesions and general symptoms to which they give rise. It is evident that no inconvenience can follow this method, when the individuals which compose the class unite together a very great number of common characters, and their physiological action is almost identical. Generalities are then even indispensable, on account of the facility they afford of retaining a multitude of important facts. But is this the case with the class we are treating of?—We are of opinion that it is not. How many substances do we see classed together, which evidently exercise a different mode of action. What connexion is there, for instance, between the Hellebore, the Spurge-flax, and the *Jatropha Curcas?*—Do not these two latter substances act by producing a strong inflammation, whilst the first, being rapidly absorbed, exerts a fatal action on the nervous system, and produces only a slight inflammation? If we have united in one catalogue objects so dissimilar, it is because they are found in the classification proposed by *Vicat*, adopted by *Fodéré*, and which we have followed. We are conscious of the extreme difficulty attending a new arrangement founded on the mode of action of poisons; and, till we shall have multiplied the experiments in the different climates of Europe, we shall not hazard the proposal of an Essay at Classification. These considerations will exonerate us from giving to this article all the extent it is capable of

receiving ; we shall confine ourselves to the propositions following :

1st. The major part of acrid poisons produce a strong local irritation followed by inflammation, more or less intense, of the parts to which it has been applied, and death takes place through the sympathetic irritation of the nervous system, without the poison being absorbed : the animals almost constantly die in a state of dejection, and of general insensibility. In these cases, the phenomena of poisoning make their appearance more rapidly when the poison has been introduced into the stomach, than when it has been applied to the cellular texture. The Spurge-flax, *Jatropha Curcas*, &c. appear to act in this manner.

2nd. Sometimes, after having inflamed the texture, the poisonous substance is slowly absorbed, and carried into the circulation ; and its effects depend on the direct action it exerts on the nervous system, and on the sympathetic irritation of this same system. Under certain circumstances, the poisons thus absorbed act on the rectum ; such are the colocynth and savine. Some affect the lungs also.

3rd. There exist a certain number of acrid poisons, which are rapidly absorbed, and carried into the circulation, and which produce in a short time repeated vomitings, vertigoes, and the most perfect stupefaction. The roots of black and white hellebore are of this number. Death takes place more speedily when these poisons are applied to the cellular texture, than when they are introduced into the stomach. Does this phenomenon depend on the digestion of the hellebore in this viscus, and on its decomposition, or is the venous absorption more active when a wound is made in the thigh, and some small veins have been consequently cut?——Be it as it may, these poisons produce a slight inflammation, and exert an action on the lungs.

4th. Lastly, some of the poisonous substances of this

class are rapidly absorbed, and give rise to vertigoes, violent convulsions, complainings, &c. phenomena which appear to partake both of excitement and stupefaction, and which depend on an immediate action upon the nervous system. They produce, besides, inflammation of the texture with which they come in contact: this is the case with Aconite.

861. It will be observed, without doubt, in the preceding propositions, that we admit the absorption of some of the poisons of this class, whilst at the same time we attribute the effects produced by the rest, to a sympathetic irritation of the nervous system. We believe we are able to explain the reasons which induce us to admit, or to reject their absorption.

A. It is evident that, if the poisonous substance when applied to the cellular texture, exerts only a slight local action, and produces, in a short time after its application, vomitings, vertigoes, convulsions, and death, in the course of a few hours, we ought to admit *that it has been absorbed.*

B. For a still stronger reason may we affirm, without fear of error, that the poisonous substance *has been absorbed* in the case where the application to the cellular texture has been immediately, or almost immediately, followed by symptoms more or less serious, terminated by death, and on dissection there are discovered inflammations in the lungs, or digestive canal, as takes place with tartar emetic, arsenic, and corrosive sublimate.* Again, it appears certain that *it has been absorbed,* but in a slow manner, when, being little soluble in water, its application to the cellular texture is not followed by any remarkable symptom, till after the expiration of four and twenty, or six and thirty hours; death does not supervene before

* My friend and pupil, Dr. Smith, has just supported an excellent inaugural dissertation entitled, *Essai sur le Danger de l'Application des Caustiques;* in which he proves that corrosive sublimate is absorbed, when applied to the cellular texture, and that it produces constantly inflammation of the stomach. (Vide *Appendix* at the end of this volume.)

two or three days; and it has only exerted a local inflammatory action, not very violent, and which cannot be regarded as the cause of death.

C. It is also extremely easy to conclude, that *it has not been absorbed*, when its application to the cellular texture is not followed by any general symptom, and is confined to the production of an extensive slough. Thus we may cauterize repeatedly the limb of a dog with concentrated sulphuric acid, caustic potash, nitrate of silver, &c. several days will elapse before the animal will discover the smallest sign of derangement in the functions performed by the principal organs, and it is not till nature shall have excited an inflammation, in order to throw off all those parts which have become extraneous, that the animal can sink under the excess of pain.

D. But can it be concluded that the poisonous substance *has been absorbed* in cases where it produces a very violent inflammation in the cellular texture, with which it has come in contact, where death takes place on the first or second day, when the animal has not vomited, when no lesion of the principal organs is discovered after death, and nevertheless the substance is dissolved in water, and placed in the interior of the thigh, near to the lymphatic vessels, and a multitude of venous ramifications?—Such is the question on which we wish to throw light, and it embraces a multitude of substances; for instance, Nitre, Euphorbium, Jatropha Curcas, &c. We are of opinion, 1st, that it is of no use to admit the absorption of any of these substances, in order to explain the phenomena they produce; 2nd, that it is probable it does not take place. The first of these propositions will appear evident, if we call to mind that the application of these substances produces a violent inflammation, accompanied by severe pains, which may be compared to an extensive burn. Now we know, that in affections of this nature, sympathetic lesion of the nervous system has often produced, in animals, a speedy death, without any absorption having taken place.

In what manner has the nervous system been affected?—— The following are the data which tend to induce a belief that *none of these substances have been absorbed.* Strictly speaking, we cannot acquire the certainty that a poison has been absorbed, unless it shall be found in some part or other of the internal organs; nevertheless it is agreed on to admit absorption whenever, after a speedy death, inflammatory phenomena, or sloughs, are discovered in any part where the poison has not been applied; as for example in the digestive canal; or when, a short time after its application to the cellular texture, the animals are seized with vomitings, vertigoes, convulsions, &c. Now the poisons in question produce none of these effects. Besides, a great number of substances which are evidently absorbed, act much more rapidly when applied to the cellular texture of the thigh, than when introduced into the stomach: such are the Hellebore root, both black and white, Upas-tieuté, Nux Vomica, Purple Foxglove, Opium, &c. In this case, on the contrary, death takes place constantly much later when the poison has been injected into the cellular texture, which seems to prove that it depends on the nervous irritation, which is much more violent in the stomach than in the limbs.

862. It will probably be objected that the poisonous substances we are speaking of are capable of being absorbed, and of producing, independently of a violent local irritation, effects more or less sensible on the texture of the internal organs; in this case death would depend on several different causes. This objection may be of some weight, but it is not founded on any fact of pathological anatomy, and consequently we cannot admit it.

It is *moreover possible* that we may be accused of wishing in almost every instance to explain death by the unappreciable lesions of the nervous system. In fact, it may be said to us, (especially after reading the different articles contained in this volume) the nervous system is affected in a multitude of

ways which bear no apparent resemblance to each other: what is there in common between the symptoms produced by Camphor, *Cocculus Indicus*, Nux Vomica, Upas-tieuté, and those produced by Opium, Hellebore, Cherry Laurel, or still more by Squill, Purple Fox-glove, Euphorbium, Bryony, Gamboge, the different corrosive poisons, &c. &c.? The knowledge we have of the infinite lesions of which the nervous system is susceptible, is so confined, that it would be needless to try to give a satisfactory solution of this question; it is nevertheless perfectly demonstrated, a multitude of different causes are capable of affecting this system, and producing affections, which have very little resemblance to one another. Examine the list of mental derangements, so ably delineated by the illustrious *Pinel*, how striking the difference in comparing the furious maniac with the idiot! and again what relation is to be discovered between these affections and epilepsy, paralysis, *ataxic* fevers, and a multitude of the *neuroses*, unless that there is a derangement in the sensitive faculty, and in the phenomena depending upon it? We shall make it appear, however in the sequel, that certain poisons, which act on the nervous system, affect peculiarly and constantly certain parts of it, such as the brain, the spinal marrow, &c. &c.

TREATMENT OF POISONING BY ACRID POISONS.

863. Does there exist any antidote to the acrid poisons?

If it be admitted that an antidote is a substance capable of decomposing the poison in the stomach, and of forming a fresh compound which does not act on the animal economy, we can affirm that we know of no body possessed of this property with regard to the acrid poisons. These poisons belong for the most part to the vegetable kingdom; now the analysis of vegetables is too little advanced for us to be able to determine exactly what is the intimate nature of the poison-

ous principle which they contain, and consequently what is the re-agent capable of decomposing it. It would be absurd, in the present state of science, to attempt to arrive at the solution of such a problem by theory; there would hardly be any thing more than conjecture and chance which could conduct us, with the aid of a multitude of experiments, to a discovery of this sort. Let us hope that modern chemistry, by bringing to perfection vegetable analysis, will furnish us with the means proper for elucidating this important subject.

864. But if no antidote exists for acrid poisonous substances, there are abundance of medicines which, properly administered, are capable of quieting, diminishing, and even of removing altogether the symptoms of poisoning. What then is the line of conduct to be pursued by a physician called in to a disease of this kind?

865. If the poison swallowed be of that kind which acts by producing a violent inflammation, succeeded by a sympathetic affection of the nervous system (and almost all the poisons of this class act in that manner), the antiphlogistic treatment must be employed, after having encouraged vomiting by the assistance of copious warm mucilaginous drinks, and even by means of cold water. Emetics, vinegar, and all other substances that are capable of increasing the irritation of the parts already affected, are to be avoided with great care, as we have had occasion to observe in a great number of experiments made on that subject. In cases where the vomitings should be extremely violent, a few drops of Sydenham's liquid laudanum should be administered; in fine, the data we have before established in speaking of corrosive poisons should be entirely followed. (*Vide* articles, *Corrosive Sublimate* and *Arsenic*, vol. i. p. 1.)

866. If the poison should be of the number of those which are rapidly absorbed, and which direct their principal action to the nervous system, the kind of lesion of that system must be paid attention to. Thus, for example, the poisoning pro-

duced by the roots of hellebore, which occasion a very remarkable stupefaction, will be combated by an infusion of coffee and camphor in small doses frequently repeated; and if these medicines are thrown up a short time after their ingestion, they must be used in injections and in frictions: it must not however be forgotten, that these poisons produce also an inflammation, which must be combated by emollient drinks. Lastly, in these kinds of poisonings, recourse must be had to emetics only in cases extremely rare, where the poisonous substance shall not have excited copious vomitings.

867. If, instead of being stupefied, the nervous system be in a state of great excitement, which very seldom happens with poisons of this class, recourse must be had to opiates, and the different medicines which are capable of diminishing this excitement.

868. We may then reduce to the following precepts whatever relates to the treatment in question: 1st, to favour vomiting by copious mucilaginous drinks, at least unless the poisons should naturally provoke sufficient evacuations: 2nd, to appreciate the nature of the secondary phenomena produced, and to combat them by appropriate means, which will vary according to the kind of lesion that has taken place. . . . .

CHAPTER IV.

Class 4th. OF NARCOTIC POISONS.

869. The denomination of *Narcotic Poisons* is given to those which, being rapidly absorbed, produce stupor, drowsiness, paralysis or apoplexy, and convulsions.

OF OPIUM.

870. Opium is a gummy resinous juice, produced by incision of the head of the white or garden poppy (*Papaver Somniferum*), and concreted. It is heavy, compact, homogeneous, soft, of a reddish brown colour withoutside, slightly shining, opaque, plastic, somewhat capable of adhering to the fingers; its fracture presents a greenish or blackish tinge; its smell is strongly virulent and nauseous; its taste acrid, bitter, and hot. It inflames when brought near a lighted candle, and burns with a strong brightness: its odour at that time is not Narcotic. It dissolves partly in water, whatever be its temperature: warm water softens it, and reduces it to a soft paste, so that it may be cleared from extraneous bodies, by passing it through cloth with expression. Vinegar, lemon-juice, wine, and alcohol, equally produce the solution of a part of the opium. *M. Desrosne*, who has been successfully employed on the analysis of this juice, has found, 1st, a crystallizable substance; 2nd, an extractive matter; 3rd, resin; 4th, oil; 5th, an acid; 6th, a small quantity of feculent mat-

ter; 7th, mucilage; 8th, gluten; 9th, remains of vegetable fibres, and sometimes a small quantity of sand and little stones.

ACTION OF OPIUM ON THE ANIMAL ECONOMY.

Experiment 1st. At eight in the morning, a small robust dog was made to swallow three drachms of crude Opium. At ten, the animal experienced no sensible phenomenon. At half past twelve, his posterior extremities were extremely weak, and paralyzed; he kept himself lying always on the belly. The muscles of the trunk and face were attacked with violent convulsions, so that the animal made strange contortions of countenance, and was every moment moved from his place, notwithstanding that he supported himself firmly upon his four legs. His physiognomy exhibited stupidity; the pupils were not more dilated than in their natural state; the organs of vision and of smelling exercised their functions freely; the animal did not moan at all, but appeared extremely dejected; the pulsations of the heart were slow and feeble. At six in the evening, the convulsive twitchings were stronger and more frequent; the whole of the posterior parts were completely paralyzed. He died in the night. The next day he was opened; and it was remarked that the head was slightly reversed toward the back, the legs stiff, and separated one from the other. The stomach contained almost the whole of the Opium, which might be recognized by its smell. The mucous membrane of this viscus was covered over with a slight whitish colour, easily detached, and presented no vestige of inflammation; the lungs exhibited several livid patches distended with blood, very little crepitating.

This experiment, repeated upon other dogs with the crude Opium, or with the watery extract, furnished similar results.

Sometimes however, the animals vomited after having experienced effects more or less decided, and some of them have recovered without receiving any assistance.

Experiment 2nd. At half past eight in the morning, two drachms of the aqueous extract of Opium, were introduced into the stomach of a small dog, weakened by an experiment made a few days before, and the œsophagus was tied. Twenty minutes after, the posterior extremities began to grow weak, and the animal uttered plaintive cries. At eleven o'clock he was attacked with violent convulsions; he exhibited a tremor of the head, and a great tendency to drowsiness: nevertheless he both saw and heard extremely well. At three, the posterior extremities were completely paralyzed; the animal made from time to time slight leaps, similar to the shocks impressed on frogs, by the disengagement of the fluid from the voltaic apparatus. At six, he was lying down on the side in a state of great debility. He died at eight. The next day he was opened. The digestive canal exhibited no alteration; the blood contained in the ventricles of the heart was black, and coagulated; the lungs presented livid spots, the texture of which was dense, and distended with blood.

This experiment repeated several times on other dogs, furnished similar results. When the dose of the extract swallowed was three or four drachms, the animals died two or three hours after taking the poison. In general the pulsations of the heart became stronger and more frequent. There were however some in which the circulation became slower.

Experiment 3rd. At forty minutes past seven, was injected into the cellular texture of the thigh of a small dog, one drachm of the watery extract of Opium, dissolved in two drachms and a half of water; the edges of the wound were retained by suture, and it was ascertained that the pulsations of the heart were to the number of ninety in a minute. Five minutes after, the animal began to moan; his posterior extremities were weak, and as it were paralyzed; the heart

beat a hundred and twenty pulsations in a minute. At the end of four minutes the paralysis of the posterior extremities was complete, the circulation more accelerated, and the contractions of the heart stronger than before. At five minutes past eight, the animal was suffering violent convulsions; he kept himself lying on the belly, with the posterior extremities separated and stretched out, the anterior firmly fixed to the ground, the head bent backwards; the heart beat one hundred and forty strokes in a minute. These phenomena only lasted a few minutes; but they might be instantly reproduced at pleasure by a slight shock given to the animal. At thirteen minutes after eight, the limbs were stiff, and the animal in a state of great dejection; the head, which appeared very heavy, exhibited a very remarkable trembling; the muscles of the lower jaw were agitated by convulsive movements; the moaning continued, and the circulation by no means relaxed. These symptoms went on increasing, and the animal died at twenty-five minutes after eight; he had preserved the free use of the organs of vision and of hearing. He was immediately opened; the body was by no means stiff; the heart contracted, and was somewhat flabby; the blood contained in the left ventricle was fluid, and rather of a bright red; the lungs, which were of a rose colour, were rather less crepitating than in their natural state.

Experiment 4th. At half past seven, half a drachm of a watery extract of Opium, mixed with a drachm of water, was applied upon the cellular texture of the thigh of a strong dog of middle size. Seven minutes after, the animal was lying upon his side, and had a decided propensity to sleep; the pulse beat ninety times in the minute. At three quarters after seven, the posterior extremities were feeble; the animal was lying as if asleep, and woke from time to time with a start; he had some convulsions. At eight o'clock the paralysis of the posterior extremities was complete. Twenty minutes after, the heart beat a hundred and thirty strokes in a minute;

the contractions were strong, unequal, and intermitting; the trunk and head were attacked with violent convulsions, which took place by starts, and which could be produced at will on touching the animal: he then stretched out his head, and reversed it upon the back; his fore-feet were firmly fixed to the ground: he uttered no moan. At forty-three minutes after eight, the pulsations of the heart were to the number of a hundred and fifty per minute. At a quarter past nine, the agitation was increased, principally in the fore-feet, with which the animal at intervals beat the ground, and with some force. At half past eleven, the head was trembling, the shocks were violent enough to lift the whole body. These symptoms went on progressively, and the animal died at five minutes before one o'clock. He was opened the next day: the lungs were livid, distended with blood, dense, and somewhat crepitating; the blood contained in the ventricles of the heart was coagulated; the digestive canal presented no alteration; the wound was very little inflamed.

Experiment 5th. At half past ten in the morning, fifty grains of a watery extract of Opium were applied upon the cellular texture of the thigh of a small dog, and the wound was united by suture. The animal in a short time experienced the symptoms described in the preceding experiments, and died an hour and half after.*

Experiment 6th. At a quarter before one, the same experiment was repeated with a drachm of the extract of *black poppies.* At two, the animal was uttering plaintive cries; his posterior extremities began to bend; the pupils were a little dilated, and there was a slight tendency to drowsiness; the breathing was neither laborious nor accelerated; the contractions of the heart were slower, being only fifty-six

* It is essential to remark that two drachms of the same extract, introduced into the stomach, do not destroy dogs in less than ten, twelve, eighteen, and twenty-four hours, even when vomiting is prevented by tying the œsophagus.

in the minute; the mouth was filled with saliva. Six minutes after, he vomited, at two different times, a tolerably large quantity of fluid matter. At half past two the drowsiness was increased, and the animal continued to moan. At four, the pulsations of the heart were not more accelerated. At half past six, he was walking about well enough; nevertheless he died in the night. The wound was slightly infiltrated with blackish blood; it was very little inflamed; the mucous membrane of the stomach was lined with a stringy mucus, thick, and of a grayish colour; the inferior lobe of the lungs was distended with blood, and reddish; the blood contained in the ventricles of the heart was black and coagulated, and the animal had only been dead four or five hours.

Experiment 7th. A drachm of watery extract of Opium was injected into the anus of a small dog, dissolved in an ounce of water; the fluid was almost instantly returned: nevertheless at the end of two minutes, the animal vomited twice, and had a tendency to drowsiness. Five minutes afterwards, he could with difficulty support himself on the hindlegs, and appeared to be plunged into a profound sleep. The heart beat only fifty-five strokes in the minute, but its contractions were strong, and somewhat irregular. Half an hour after the injection, the muscles of the face, neck, and lower jaw, were agitated by slight convulsive movements; the posterior extremities were from time to time affected by tolerably violent twitchings; the pupils were moderately dilated; the animal was very little sensible; when shaked briskly however he endeavoured to get up, by supporting himself on his forefeet, and instantly fell again. These symptoms lasted several hours, then disappeared insensibly, in such a manner that in the course of two days, and without any assistance, the animal was perfectly restored.

The same experiment repeated upon other dogs gave similar results. Often enough however the poison has been returned in a few seconds after, and the animals experienced

only vomitings and a slight paralysis of the posterior extremities: this more particularly happens if, for the watery extract of Opium, a decoction of *Poppy heads* be substituted.

Juarin had already observed, that a single grain of Opium, or twenty drops of *Sydenham's Laudanum*, given in a glyster, had produced a remarkable uneasiness, and an incipient paralysis of the inferior limbs. (*Animadversiones Practicæ*, p. 234.)

Cotunni, in his work *de Ischiade Nervosâ*, § 42, asserts, that he believes that Opium injected in a glyster, may have greater efficacy than in any other way. This opinion is at this moment entertained by a very great number of enlightened practitioners.

Experiment 8th. Eight grains of the watery extract of Opium, dissolved in three drachms of water, were injected into the jugular vein of a great dog. The animal instantly fell down on the side, and appeared to be asleep; his posterior extremities were paralyzed, and he could not possibly keep on his legs; the pulsations of the heart were not more frequent than before the injection. Twenty minutes after, the relaxation of these was very remarkable; the animal uttered no plaintive cry, and when shaken he awoke, but fell into a sleep again a few moments after. The next day he walked about tolerably freely, and was scarcely at all drowsy. He constantly refused food, and died eight days after the injection, without having experienced any other symptoms than dejection, and a slight tendency to drowsiness. He was opened five hours after death; the heart was flaccid, and contained fluid and blackish blood. The lungs, which were for the most part of a rose colour, presented in each lobe eight or nine black spots, of the size at least of a lentil, and of half a line in thickness, formed by a dense substance, similar to the texture of the liver, and not at all crepitating; the remaining portions of the lungs contained air. There was found in the inferior lobe of the left lung, a patch about two inches in

length, and half an inch in breadth, of a livid colour; and from which, on being cut into, issued out a tolerable quantity of reddish serosity. The superior portion of the pia mater, corresponding to the anterior and posterior extremities of the right lobe (of the brain), was strongly injected with red in a circular space, the diameter of which was about four lines; it appeared black. The right ventricle contained a small quantity of reddish serosity, and the vessels running over it internally were of a bright red, and pretty strongly injected. There was no lesion of the left hemisphere.

The same experiment repeated on another robust dog, with five grains of the extract, furnished results somewhat different. Immediately after the injection, the head was forced forward, the limbs became stiff; at length drowsiness, convulsions, and paralysis of the posterior extremities quickly made their appearances. The next day, the animal appeared tranquil, and preserved a marked propensity to drowsiness; he refused food, and died five days afterwards. The brain presented *no apparent lesion;* the lungs were nearly in the same condition as in the preceding experiment.

In other instances we have witnessed dogs to recover perfectly, and without any assistance, after having experienced symptoms similar to those we have just mentioned, which had been produced by the injection of three or four grains of a watery extract into the jugular vein.

Observations.

1st. A young lady, twenty-two years of age, poisoned herself with Opium: the following symptoms were observed: perfect immobility and insensibility; countenance pale and cadaverous; pupils insensible to the impression of light; lower jaw fallen, and very moveable; muscles of the limbs and trunk in a state of relaxation; deglutition ceased; respiration for the most part scarcely perceptible; less heat of skin than in the natural state. Inhaling of ammonia, stimulant frictions,

blisters, antispasmodics internally, and stimulant glysters, were employed without any success. The patient vomited some liquid matter, which was blackish ; she only recovered her senses to fall again in a moment after into a state of stupidity ; and died about seventeen hours after having swallowed the Opium.

2nd. A lady, after several attacks of melancholy, for which a number of antispasmodic remedies had been employed in vain, swallowed one morning a drachm of crude Opium. Immediately, a propensity to coma ; sleepiness ; pulse at first small, almost imperceptible, afterwards full and slow ; respiration painful, sterterous ; sometimes intercepted, &c. When the patient was strongly shaken, she was roused for a few minutes from her lethargy, and information was then obtained respecting the manner in which she had proceeded with the poison ; but, in a short time she complained of having been awoke, wished for a speedy death, &c. : she turned towards the attendants ; eyes open, languishing, and dejected. In vain was tartarized antimony, and acidulated drinks administered to her, scalding the legs with boiling water was employed in vain, or frictions with an irritating ointment of cantharides, &c. ; she expired about eleven o'clock at night. (*Nouveaux Elemens de Thérapeutique de M. Alibert,* tom. ii. p. 61. 3rd edition ; observ. de *M. Leroux.*)

3rd. An aged nun of sixty-four was seized with the *senile gangrene* of two of the fingers of each hand, the consequence of chilblains. This patient reported that the sensibility of her fingers was so closely allied with that of the stomach, that when she suffered hunger, she lost the power of using them as the organs of touch. She suffered dreadfully, and Opium alone could procure her the enjoyment of sleep. It is not known at what hour of the night she took a composing julap, which had been entrusted to her in the evening for her own use ; but at break of day she crossed one of the wards of the Hospital of Saint Louis, for the purpose of satisfying some necessity. Scarcely had she returned to her bed than

she fell into a profound sleep; her breathing was intercepted, her countenance grew pale; the pulse was slow, eye-lids depressed, eyes motionless, pupils contracted; there was a distortion of the mouth, and a kind of rattling in the throat, similar to that which precedes death. In the evening, the symptoms the same: there was only a variation in the pulse, at one time full and free, at another small and frequent; the temporal arteries beat with a sort of throbbing. I ordered two glysters with cream of tartar, because deglutition was impossible. The patient passed the night in the same condition, and did not die till the next morning at five o'clock. On opening the body we found a fibrous concretion, abounding with filaments and dense, in the right ventricle, and which threw out a branch of three or four inches into each pulmonary artery. The opiated liquor was still in the stomach. (*Idem*, p. 60.)

4th. On the 6th of November last, about four in the afternoon, Mr. A. Cooper informed me, that he had just been to see a young man of about eighteen years of age, who, at ten in the morning, had swallowed about six ounces of laudanum, which remained in the stomach, and had produced symptoms which threatened a speedy death. Mr. Cooper, who only saw him five hours after the accident, informed me that he had given him, at half past three, a solution of a drachm and half of white vitriol (Sulphate of Zinc), which had produced some retchings, and caused him to vomit about an ounce and half of a fluid, which exhaled a strong smell of Opium. The state of lethargy had gradually increased; he had also fallen into a state of complete insensibility, and sinapisms had been applied without any remarkable effect.

Mr. Cooper having invited me to see this young man, in order to take such further means as circumstances might dictate, I went there at a few minutes after four. I found the patient on the floor, upon his knees, with the body bent forward, and supported by two of his friends, who, as I learned

shortly after, had formed the determination to replace him in the bed, and leave him to his fate, having no further hope from any medicines that might be employed. His head was resting on the sternum, his eyes closed, countenance pale; breathing slow and sonorous, as in a state of apoplexy; his hands were cold, and the pulse beat from ninety to ninety-six strokes in the minute, but in a weak and irregular manner. All his muscles were in a state of relaxation, and the flesh of his arms especially was extremely soft to the touch, and void of elasticity.

The blue vitriol, or sulphate of copper, was the first remedy that came into my mind for exciting vomiting; about half a drachm of this substance was immediately dissolved in water, and the patient being rudely lifted up, and strongly shaken, he opened his eyes, and seemed as if he wished to offer some resistance to the attempts which he perceived us to make. We continued however to pour down his throat about half the quantity of the vitriol, which was a dose equal to fifteen grains, which he swallowed with a degree of difficulty, such as might be supposed to exist just at the last gasp. Instantly his countenance, which had been for a moment animated, became more ghastly than ever. It was scarcely a minute after he had swallowed the whole dose, when he threw up on a sudden, a great quantity of a brownish fluid, which exhaled a strong smell of laudanum, which was immediately followed by two other similar vomitings, the whole of which might be esti mated at two pints. He was then made to swallow some warm water, and removed briskly into another room, with the intention of opposing that state of numbness in which he was. His limbs, which at my first entrance were entirely deprived of motion, returned a little to their state of contraction, for he began to support himself on his legs with the assistance of the persons who were about him. He continued however to keep his eyes shut, unless when awoke by a brisk and sudden call; the pupils were dilated, the breathing apo-

plectic. I recommended strongly to his friends, who were extremely active, and very intelligent, to keep him as much as possible on the legs, and walk him continually about the room.

When I came again to see him, about nine in the evening, I found him sufficiently recovered to take that exercise with the assistance of one of his friends. His countenance appeared more natural, but he still answered only by monosyllables when pressed by questions, and that like a man in a state of extreme intoxication. He had vomited once or twice in the course of the afternoon, and gave me to understand that he felt a sensation of cold at the pit of the stomach, a remarkable heat on the surface of the body, and a marked coldness of the extremities. Notwithstanding the state of amelioration which we could perceive, his sleep was still profound, he snored strongly even when he was walking about the room; and when suddenly woke, he opened his eyes, and often fell again into his state of somnolency. Mr. Cooper came also to see him in the evening, and we both agreed to recommend that he should still be kept in the same state of forced activity during the night, and should be made to take repeated doses of assafœtida with the volatile alkali, camphor, and even musk, if the other stimulants did not appear sufficiently active. It was moreover agreed that a blister should be applied to the head, and sinapisms to the feet, and that tea and coffee should be frequently presented to him, as also lemon juice, of which he had taken some small doses during the evening with very great advantage. We recommended also that he should not be left, during the night, more than half an hour, without rousing him from his lethargy, in order to make him take some medicine, or some nourishing drink.

On seeing him the next morning, November 7th, I learned that at twelve o'clock, he had been so much better, that his friends deemed it unnecessary to apply the blister: a small

quantity of camphor julep with assafœtida was the only medicine that he had taken; but he frequently made use of tea, coffee, and lemon juice, which he took with great pleasure. He had likewise been prevented from sleeping, being kept incessantly in a state of constant agitation, till six in the morning, at which hour he returned to his bed.

I saw him in the morning; I found him still asleep; but on approaching him he awoke suddenly with a troubled appearance at first; but soon recovering himself, he said (which was correct) that he had slept, he believed, three or four hours. He complained of a painful sensation in the throat, as if it had been excoriated; he observed moreover that a glyster, which had been given him, had passed a little at a time with some excrementitious matter, without his being able to perceive it, or capable of preventing it.

The following day, November 8th, he was in a situation to walk out; his appetite was not yet returned, but yet he had not an aversion to food; he still complained of pains in the throat, and more so at the root of the tongue; pains which appeared evidently to be the result of the caustic medicines which had been given him. He had passed no stool since the accident, except what was produced by the glyster that had been given him; he was still pale and low; complaining of an uncomfortable sensation at the pit of the stomach, not however amounting to a pain; I ordered him a dose of rhubarb and calomel. He was shortly after perfectly restored. (*Transactions Medico-chirurgical*, trad. de l'Anglais, tom. i. p. 89. Observ. de *M. Marcet.*)

6th. Some young Cophts, says *Reaumur*, who sometimes were drinking together, wishing to cure the vanity of one amongst them, who piqued himself on being the stoutest drinker of the whole, contrived to dissolve, without his knowledge, a drachm of Opium in a glass of wine which he drank; they expected by that means to put him sooner to sleep and to make him appear the sooner conquered. A few hours after

having taken this drink, the young man was delirious, talked wildly, and at last fell into a profound sleep.

The next day his companions, who went to visit him in order to enjoy their false victory, were very much astonished to find him without pulse, livid, the mouth shut, in a word, dying. They sent out for a priest, who was also a physician, and who tormented the patient by the most violent remedies, for he died in very little more than fifteen hours after the accident. The body was covered with livid tumors on the arms and thighs, in the form of wens, as large as a child's head of four months (blood effused by the relaxing of the vessels and of the skin), and from which issued an intolerable stench, which attracted all the cats of the neighbourhood, that were eager to leap upon the body, and tear it to pieces with great avidity.*

7th. *Lassus* reports, that a woman died in consequence of having taken thirty-six grains of Opium. On opening the body, the stomach was found to be inflamed without erosion; the vessels of the brain were distended. *(Mémoire de l'Institut. Sciences Physiques et Mathématiques,* tom. ii. p. 107.)

8th. A patient was put to sleep, and died, in consequence of having taken a glyster into which four grains of Opium entered.† In another case, an opiated plaster applied to the temples has been seen to produce madness, and spasms in the mouth.‡

M. Nysten published in 1808 a very interesting work on Opium, from which we shall make an extract. This extract contains the conclusions from facts which precede it, and from a very great number of experiments made by this physiologist.

1st. The watery extract obtained with cold water, and which has undergone only one evaporation, is more active

* *Académie des Sciences,* vol. xxxviii. anno 1735.

† Gaubius *de Meth. concin. form. Lugd. Bat.* 1762.

‡ Monro *in Essays and Observat.* Phys. and Lit. vol. iii. p. 297.

than the other preparations of Opium, without excepting even the gummy extracts of Cornet, Béaumé, and Rousseau, prepared by repeated evaporations, by long digestion, or by fermentation.

2nd. The resinous matter, which is very little soluble, produces the same effects as the watery extract, but in a much stronger dose, and it does not inflame the mucous membrane of the stomach. If this membrane has sometimes been found in a state of phlogosis, after cases of poisoning by Opium, this phlogosis has been owing to the spirituous liquors in which the Opium has been taken, or to some other irritating substance administered as an antidote.*

3rd. The *Crystallizable essential salt*, improperly called the *Narcotic Principle*, is still less active than the resin. *M. Nysten* has taken four grains of it, and experienced only a very slight disposition to sleep.

4th. The pellicle, which separates during the evaporation of the extract, is less energetic still than the essential salt.

5th. The distilled water of Opium, strongly saturated with the aromatic principle, is capable of producing drunkenness and sleep, when taken in a strong dose. *M. Nysten* has swallowed two ounces of it without any sensible effect.†

6th. It is sufficient to inject three or four grains of the

* *Vicat* says: the resinous extract of Opium possesses very little activity; for fifteen grains of it did no harm to a dog, and *Charas* swallowed six grains without experiencing any thing but a degree of gaiety. (*Op. citat.* p. 220, anno 1776.)

† We have injected into the jugular vein of a small dog two ounces of this fluid: the animal did not appear to be incommoded. We have introduced into the stomach of another dog five ounces of the same fluid, obtained by the distillation of six ounces of water upon two of Opium: the œsophagus was tied. Ten hours afterwards, no perceptible phenomenon was observed. The next day, the animal was lying upon the side, in a state of great insensibility; the pupils were dilated, the limbs relaxed; he made some efforts to vomit, and died an hour after.

watery extract of Opium into the carotid of a dog, to kill him in the space of a few minutes.

7th. It requires a little stronger dose in order to produce the same effect, if injected into the crural or jugular vein. Nearly the same thing happens when the injection has been made into the pleura or peritonœum.

8th. The effects of Opium are always less speedy and energetic when it is injected into the cellular texture.*

9th. They take place all the same, when the watery extract has been injected into the bladder; but a great quantity will be necessary to determine death.

10th. The application of Opium to the brain is not mortal; although it is by acting especially on this organ, that Opium introduced internally, gives rise to dangerous symptoms.

11th. Opium does not destroy the contractility of those muscles with which it may be brought in contact, and the symptoms of poisoning which take place under these circumstances depend on its absorption and action upon the brain. A heart, plunged into a solution of Opium, continues to contract there for a very long time.

12th. The analogy which has been supposed to exist between the effects of Opium and those of wine is incorrect: Opium, whether in a small or great dose, directs its action to the vital properties, and it is even in this manner that it becomes a powerful sedative; wine, on the contrary, reanimates these properties; and when it even produces a debilita-

* We are of opinion that it may be added: "*a*. That they are still much less so when it has been introduced into the stomach; which probably depends, 1st, on its being partly digested and converted into a less pernicious substance; 2nd, on the venous absorption being less active. *b*. The effects of Opium are in general more decided when it is injected in glysters, than when it has been introduced into the stomach, at least, when the glyster has not been suddenly returned. Be it as it may, the injection of this medicine into the anus, is constantly followed by speedy and repeated vomitings.

ting effect, it is because they have been elevated to too high a degree of energy that they fall into a state of collapse.

13th. It is not by acting on the nervous extremities of the stomach that this poison produces death, as *With* has supposed; for animals, on which the section of the *par vagum* of both sides has been performed, die at the end of two or three hours, and after having experienced intoxication, somnolency, and convulsions, as we have described. (*Bulletin de la Société Philomatique*, Mai, 1808, tom. i. p. 143.)

872. It ought to be observed in the foregoing propositions, that *M. Nysten* confines himself to saying, when speaking of the immediate cause of death brought on by Opium, that *this medicine is absorbed, that it acts on the brain, and that it constantly directs its action to the vital properties.* But what is this mode of lesion?—Does Opium act by stupifying this organ? or does it begin by exciting it, in order afterwards to produce stupefaction?—In other words, is this medicine to be ranked among the narcotics, or amongst those which excite the nervous system?—This question, which has been long agitated among physiologists of very considerable merit, is very far from having received any satisfactory solution; this is sufficient to shew how many difficulties it presents; therefore neither do we pretend, in seeking to throw a light upon it, to investigate it thoroughly.

1st. *Balthasar Louis Tralles*, in a treatise entitled *Usus Opii salubris et noxius in Morborum Medela*, (in 4to. anno 1754) is the first who regarded Opium as a stimulant. Brown has since taken up this opinion, which he has consecrated by these words: *opium mehercle non sedat.* In fact, many physicians are of opinion at this day that this medicine is an excitant; it increases, say they, the movements of the heart, and consequently the circulation becomes more rapid; the arteries beat with greater force, the pulse is hard and full. Besides, the Turks, who take Opium pure, and in the form of extract, find in the use of it an oblivion of their calamities; a thousand

delicious images, a thousand agreeable visions present themselves to their imagination; they give themselves up to frantic and extravagant actions; roaring fits of laughter, mad proposals distinguish them; they feel a greater propensity to venereal enjoyments; all their passions, all their desires, are exalted; a warlike ardour animates their minds; they are prepared to brave death without fear—a valuable resource, which the officers of the Turkish armies know well how to turn to advantage; frequently too they abandon themselves to violent fits of madness; they murder, or stab all who make the least resistance to them. This state lasts several hours: then dejection and languor succeed. They become cold, melancholy, sad, stupid, and sleepy. Let us listen to the illustrious traveller *Chardin*, whilst recounting the effects of a certain drink prepared with the bulb and seeds of the poppy. "There is" says he, "a decoction of the head and seeds of the poppy, which they call *Coquenar;* for the sale of which there are taverns in every quarter of the town, similar to coffee-houses. It is extremely amusing to visit these houses, and to observe carefully those who resort there for the purpose of drinking it, both before they have taken the dose, before it begins to operate, and while it is operating. On entering the tavern, they are dejected, sad, and languishing; soon after they have taken two or three cups of this beverage, they are peevish, and as it were enraged; every thing displeases them; they find fault with every thing, and quarrel with one another; but, in the course of its operation, they make it up again, and each one giving himself up to his predominant passion, the lover speaks sweet things to his idol; another, half asleep, laughs in his sleeve; a third talks big, and blusters; a fourth tells ridiculous stories; in one word, a person would believe himself to be really in a madhouse. A kind of lethargy and stupidity succeed to this unequal and disorderly gaiety; but the Persians, far from treating it as it deserves, call it an extasy, and maintain that there is something supernatural and

heavenly in this state. As soon as the effect of the decoction diminishes, each one retires to his own house.

2nd. On another hand, some very respectable philosophers, at the head of whom we shall place the professor *Barbier* of Amiens, are of opinion, that all the phenomena produced by Opium, are the result of an influence essentially debilitating. This observer says: " In consequence of this debilitating action, the cutaneous capillary vessels fall into a state of atony, and lose their contractile and impulsive power; by which means it happens, that these vessels become distended by stagnant blood, which obstructs in its course that which is propelled by the heart, and which is consequently forced to accumulate in the arteries. It is also to this same cause, that is to say, to the detention of the blood in the capillary vessels, that we must ascribe the tumefaction of the face and eyes, the discoloration of the skin, and the increase of temperature observed after the ingestion of Opium. All those who die poisoned by Opium, are in a state of very decided erection; this phenomena is more particularly observable in Turks who have been killed in battle. This is moreover an erection purely passive, in which the vital properties have no concern, existing from a physical cause only. If Opium enlivens and increases the courage of the Orientals, it is because they live under a different climate; have other customs, other kind of habits, because they use this substance habitually; lastly, because they frequently do not take pure Opium, but a preparation in which the stimulant ingredients counter-balance at least the stupefiants." (BARBIER, *Pharmacologie Générale*, p. 490, an. 1816.)

3rd. *Mayer*, professor at Frankfort on the Oder, in a work entitled, *Considerations sur les Effets de l'Opium*, has looked upon the action of this substance under a point of view somewhat different. " In the dose of a quarter of a grain, or half a grain," says he, " Opium ceases to be stimulant, and may also be employed as a direct and immediate

sedative in *Hypersthenic* diseases, for instance, to quiet the erections in *blennorrhagia*. The same medicine exerts a specific stimulus on the nerves and on the system of the circulation, the energy of which it exalts, whilst at the same time it produces atony of the muscles, and obstructs or suspends the functions of the digestive organs. Hence it follows, that the calm produced by Opium has been erroneously attributed to an anterior excitement, which never takes place but when it has been exhibited in a large dose, and thus its effects may be compared to those of fatigue, and of an excess of food, which only induce quiet by an indirect debility.

873. Such are the principal opinions entertained to the present day, on the immediate effects of Opium. We are of opinion that they may be successfully confuted by means of the experiments which we have tried, and which lead us to the establishment of the following facts.

A. *Opium, employed in strong doses, ought not to be ranked either amongst the narcotics or the stimulants; it exerts a peculiar mode of action which cannot be designated exactly by any of the terms at this moment employed in the Materia Medica.*

In fact, all the animals submitted to the influence of a tolerably strong dose of this poison, are plunged, presently after, into a state of decided lethargy; their heads become heavy, they feel giddiness, their posterior extremities become weak, and are shortly after completely paralyzed (phenomena which declare a direct stupifying action). Twenty-five, thirty, or forty minutes after, the pulse is full, strong, frequently accelerated; convulsive movements take place; these movements, weak at first, become in a short time so violent, that the animals are suddenly lifted up from the ground, their head is strongly bent backward upon the spine; their extremities grow stiff by intervals, and are agitated; they utter frequently plaintive cries; (phenomena which declare a stimulant action). This excitement continues till the moment of death,

which takes place at the expiration of two, three, or four hours, and for the whole time of its continuance the symptoms of stupefaction, first produced, remain. The animals, far from being deeply sunk in sleep, are capable of being roused from their lethargy by a slight noise; by the least contact, or when any object whatever is brought near to their eyes: frequently also when shaken they grow extremely stiff, almost the same as if they had taken *nux vomica*.* How vastly different are these phenomena from those produced by Hellebore and Camphor. The former of these substances, which we consider as essentially *stupifying*, plunges the animals, shortly after its application, into a state of perfect lethargy; sensibility and the motive faculty appear to be annihilated to such a degree, as that life might be thought to be extinct three or four hours before death actually takes place, did not the phenomena of respiration shew the real state of things. (Vide pp. 2 and 3, article *Hellebore.)* *Camphor*, on the contrary, shews a decided excitement of the brain, from the moment of its application; anxiety, agitation, convulsions, contortions, and the most horrible grimaces of the face, are the primitive symptoms produced by it; to which, in a short time, succeed symptoms of relaxation and atony, which may be considered as the consequence of a prolonged excitement; besides, in cases of poisoning by this substance, the animals enjoy lucid intervals, and do not commonly die till after the third or fourth paroxysm.

B. *Opium, employed in a small dose, seems to confine its action to the production of those symptoms which we have pointed out as declaring themselves at first, such as announce stupefaction; sometimes however it produces a very consider-*

* The experiments we are speaking of were made by injecting thirty-six or forty grains of a watery extract of Opium into the cellular texture. We are of opinion, that this manner of operating is the most proper to illustrate the mode of action of poisons that are absorbed, and which might undergo some decomposition on the part of the digestive organs.

able excitement, which effects are the consequence of a peculiar idiosyncrasy.

C. *We cannot admit that there is any identity of action between Opium and spirituous liquors when employed in large doses.*

OF BLACK HENBANE (*HYOSCIAMUS NIGER*).

874. This plant belongs to the family of the *Solana* of Jus: and the Pentandria Monogynia of Lin.

Characters. Calyx tubular, consisting of five lobes; corolla monopetalous, tubular, with five unequal lobes; not much open, of a pale yellow towards the edges, and a blackish purple in the middle: five stamina; one style; flowers almost sessile, disposed on the branches in long spikes; capsule oblong, obtuse, bellying at its base, somewhat compressed; grooved with a furrow on each side, and opening horizontally towards the summit: the capsules succeeding to the flowers are all turned to the same side upon each of the spikes; embryo of the seed semicircular, placed on the edge of the perisperm. Stalk five decimetres in height, thick, cylindrical, branchy, and covered with a thick down. Leaves alternate, soft, cottony, very large, scolloped, and deeply indented on their edges. This plant grows by the road-side, and has a very disagreeable smell.

ACTION OF HENBANE ON THE ANIMAL ECONOMY.

Experiment 1st. A small dog was made to swallow two drachms of the dried leaves of Henbane, finely powdered: the animal did not appear incommoded. To another dog three ounces of the fresh root of black Henbane were given in small round slices, which had been gathered in the month of April: the œsophagus was tied. Forty hours after, the

animal had experienced no other phenomenon than dejection: the same state continued three days after the operation.

Experiment 2nd. On the same day (April 22nd,) another dog was made to take eight ounces of the juice proceeding from three pounds of the fresh root of black Henbane gathered in April, which had been pounded with two ounces of water, and one ounce of the contused root: the œsophagus was tied. Three hours afterwards, the animal was somewhat drowsy. At the end of two hours more, his posterior extremities were feeble, and bended with ease: the pupils were dilated, and the lethargy more decided; otherwise the animal experienced no giddiness or convulsions: he preserved the free use of his senses and motive faculty. The next morning, these symptoms appeared diminished; but he was slightly dejected: this state of things continued the whole day, and he died in the night.

Dissection, next day. No alteration in the digestive canal: the stomach contained a great portion of the root ingested: the lungs presented here and there livid spots, more dense than in the natural state, little crepitating, distended with blood, and with a fluid of a serous nature.

Experiment 3rd. On the 22d of April, six pounds of the fresh leaves and stalks of black Henbane were pounded, and twelve ounces of juice, which they furnished, were administered to a small robust dog; the œsophagus was then tied. Twenty-four hours after, the animal was walking about at his ease, and appeared only slightly dejected.

Experiment 4th. The 30th of June, at eight in the morning, a small robust dog was made to take two ounces of a decoction obtained by boiling an ounce and half of the root of black Henbane in three ounces of water; the œsophagus was tied. Half an hour after, the animal made efforts to vomit, and moaned. At ten, he was lying upon the side, in a state of great insensibility; he was raised up on his feet, and he instantly fell down like an inert mass; he shewed from time

to time some convulsive movements in different parts of his body; the organs of sense were no longer susceptible of impression; the breathing was deep and slow: these symptoms continued, and he died at half past ten. He was immediately opened; the heart was still contracting, and was distended by fluid blood, of a vermillion red colour, in the aortic cavities, and blackish in the pulmonary ventricle; the lungs were of a rose colour, and of their natural appearance; the digestive canal did not appear to exhibit the slightest alteration.

Experiment 5th. Two drachms of the watery extract of Henbane bought of an apothecary, were introduced into the stomach of a great dog: the œsophagus was then tied. The animal died eight days after, without experiencing any other symptoms than the dejection inseparable from the operation.

Experiment 6th. The same experiment was repeated upon a small dog, with seven drachms of the same extract. The animal died fifty hours after, without exhibiting any remarkable phenomenon. No lesion of texture could be discovered on dissection.

Experiment 7th. At six in the morning, six drachms of the watery extract of Henbane, bought of another apothecary, and dissolved in two ounces of water, were introduced into the stomach of a small dog: the œsophagus was then tied. Ten minutes afterwards, the animal made efforts to vomit, which he frequently repeated during a quarter of an hour. At twenty-five minutes after six, he uttered some plaintive cries; his breathing was deep. At three quarters past six, fresh moanings, perfect use of sense and movements, respiration very deep, and exceedingly accelerated. At seven o'clock, in the same state. At a quarter past eight he was found dead.

Dissection. The heart was no longer contracting, and was extremely hot; it contained in the left ventricle several clots, of a bright red colour; the right cavities contained some blackish clots; the lungs and digestive canal appeared sound.

Experiment 8th. A wound was made in the back of a small dog; three drachms of the aqueous extract of black Henbane, bought of the same apothecary, were brought in contact with the cellular texture, and the lips were brought together. The animal was dead four hours after. The dissection took place at the expiration of fifty minutes: the heart was extremely hot: it no longer contained fluid blood; in the right ventricle were seen a few small blackish clots.

Experiment 9th. At six minutes after eight, were applied to the cellular texture of the thigh of a robust dog of middle size, two drachms of a watery extract of Henbane, *prepared by evaporating in a water-bath the juice of the fresh root of black Henbane in full vegetation:* two drachms of water were added. At ten minutes before nine, the animal experienced some anxiety: he was agitated, and uttered plaintive cries: the pulse beat a hundred and fifty strokes in a minute. At nine, vomiting. At half past eleven, lying down on the side, continual moanings. At twelve, in a state of great insensibility, weakness of the posterior extremities. At one o'clock, death.

Dissection. The lungs were livid, dense, and distended with blood; there was no alteration in the digestive canal, nor in the limb operated on.

Experiment 10th. A wound was made on the back of a very strong mastiff dog; four drachms of the *resinous* extract of Henbane, bought of an apothecary, were brought in contact with the cellular texture: the lips were brought together by a few stitches. Two hours afterwards, the animal, who had exhibited no remarkable phenomenon, began to experience vertigoes. Ten minutes after, he staggered so much as not to make two steps without falling; his posterior extremities were extremely feeble, and he preserved the use of his senses; he was nearly in the same condition an hour after. The next morning, he appeared to be recovered; however, he still refused food. Four days after the operation, he kept

himself lying on the side, and would not take any food. He died in the night.

Dissection. The ventricles of the brain contained no fluid; the veins on the external surface of this organ were gorged and distended; the lungs, which were for the most part of a deep red colour, presented a few blackish spots; they were somewhat less crepitating than in their ordinary state; the wound was not much inflamed.

Experiment 11th. This experiment was repeated upon a small dog, and two drachms and a quarter only of the same extract bought at another shop, were applied upon the cellular texture of the thigh. The animal died at the end of seven days, without having exhibited any other symptom than dejection and loss of appetite. No lesion was discovered on opening the body.

Experiment 12th. At eight in the morning, twenty-eight grains of the aqueous extract of Henbane, bought of an apothecary, and dissolved in four drachms of water, were injected into the jugular vein of a small strong dog. Instantly the animal experienced slight vertigoes, he staggered for four or five minutes, then stopped; his posterior extremities became more and more feeble; he was drowsy; still he preserved the use of his senses. Twenty minutes after, seeing he was still in the same state, ten grains of the same poison dissolved in a drachm of water, were injected into the other jugular. In an instant, the animal appeared to be completely put to sleep; his posterior extremities were much more feeble; he lay down upon the belly, his four legs separated from one another, his head somewhat elevated, and inclined to the left side, without any convulsive movements; he was roused, and placed on his feet; he awoke, and remained so a few moments, then resumed his first attitude. The next day, he was very well, and ate a little. The day following, he was again attacked with vertigo, and died in the night, about sixty-eight hours after the injection. The lungs were somewhat

red, scattered over with a few small blackish spots; the brain exhibited nothing remarkable.

Experiment 13th. Forty-eight grains of the same extract, dissolved in six drachms of water, were injected into the jugular vein of a small dog. The injection was scarcely finished, when the animal was put to sleep; he had some slight convulsive motions of the extremities, and died. The body was not opened.

Experiment 15th. Eighteen grains of the resinous extract of Henbane suspended in two drachms of water, were injected into the jugular vein of a small dog. At the end of ten minutes the animal made efforts to vomit, and threw up some stringy matter mixed with bile. Twenty minutes after the injection, his posterior extremities grew feeble, his head was heavy, and he fell asleep without experiencing any vertigo. A quarter of an hour after, the lethargy was more decided; nevertheless, he could easily be awoke by making any noise. The next day, he was in excellent health. Forty-five grains of the same extract, suspended in half an ounce of water, were injected into the other jugular. The animal instantly separated and extended the hind feet; the head was reflected upon the back; there was a decided trembling of the muscles of the trunk. He died three minutes after. The body was instantly opened; the heart was no longer beating; the blood of both ventricles was all coagulated; that contained in the aortic cavity was of a vermillion red; the lungs were of a rose colour, and not much distended with blood; the digestive canal exhibited no sensible alteration.

Observations.

1st. *Baudouin* and *Laudet* ate on the 12th, at nine in the morning, some young shoots of black Henbane dressed with olive oil. In a short time the ground appeared to fly from under their feet; their countenance became stupid; their tongue was paralyzed, and their limbs became benumbed.

M. Choquet, physician of the hospital of Puerto Real near Cadiz, was called in the same day at two in the afternoon; and found them with their eyes hagard, the pupils very much dilated, their look fixed and dull, their breathing difficult, pulse small and intermitting: there were besides, *aphonia, trismus, risus sardonicus,* loss of sense, aberration in the functions of the intellect; which, together with disposition to sleep, placed these patients in a state of *typhomania;* the extremities were cold, the inferior ones paralyzed, the superior agitated by convulsive movements; to all these alarming symptoms was added also *carphologia.*

M. Choquet, after having conquered the contraction of the jaws, caused each of the patients to swallow the half of a solution of ten grains of Antimoniated Tartrate of Potash, in two pints of water. *Laudet* vomited a tolerably large quantity of fluid, in which it was easy to distinguish the parts of a plant altered by coction. The emetic water was continued, and purgative glysters were administered, which produced in *Laudet* vomitings, and abundant alvine discharges. The state of mania with delirium, but without fury, in which *Baudouin* was, rendered him by no means docile; he took considerably less of the emetic solution, and consequently had only very slight evacuations. To these means succeeded the administration of wine vinegar in large doses, dry frictions over the whole surface of the body, and particularly the abdomen. At ten in the evening, *Laudet* already experienced a sensible amelioration; his delirium had ceased, the difficulty of breathing was less, he was awake, had recovered a little of his natural warmth, sensation, and speech; the other symptoms had undergone but little diminution. The paralysis of *Baudouin* had also somewhat diminished, as well as his propensity to sleep; but the other symptoms appeared to be exasperated, and his madness was extreme; it was very difficult to hold him. M. Choquet continued the use of the vinegar, purgative glysters, and frictions, during the night of the 12th.

On the 13th, at seven in the morning, *Laudet* made use of his limbs with facility; his pulse was perfectly developed, and his bowels free, whilst he enjoyed all his intellectual faculties: he felt only a small degree of head-ache above the orbits, resulting from the bad disposition of his digestive organs: a strict low diet, and the use of lemonade, in a short time removed every complaint. *Baudouin,* who had attempted to run away during the night, was stopped by the guard of the hospital; and as he only could recollect himself confusedly, his delirium was continually running on assassination, desertion, bayonets, and court-martial: his pulse was very much accelerated, but more regular, and not so tight as on the 12th. His appearance was still fixed, his countenance hagard, and the abdomen was extremely hard and tense. Attributing the duration of these symptoms to the circumstance of the patient having had only very slight evacuations, sixty grains of a purgative powder were administered to him in the form of a bolus; this drastic, joined to purgative glysters, produced several stools. Towards noon, the pulse was considerably elevated, the breathing was become full, and a copious perspiration, which was soon succeeded by a looseness of the belly, terminated this useful secretion; in fine, at four in the evening, *Baudouin* was nearly as well as his comrade; he had equally regained the use of his faculties, speech, sensation, and motion. Two days of regimen, and the use of lemonade, sufficed at length to put these two soldiers into a situation to return to their duty.*

2nd. *Dr. Picard* says: "a glyster ordered for a lady, labouring under an ulcer of the womb, with the decoction of black Henbane, produced in a very short time the following symptoms: face extremely red, stiffness of the tongue, a state of numbness and loss of motion in the right arm, leg, and thigh of the same side; propensity to sleep, respiration

* Observation by M. Choquet, Doctor of Medicine, *Journal de Leroux et Corvisart, Avril,* 1813, p. 335.

hurried, great difficulty in the functions of hearing; in short, almost all the symptoms which characterize an attack of apoplexy, except the stertor and distortion of the mouth. These symptoms were combated with oxycrate, and the patient was perfectly restored."*

3rd. *Wepfer* relates, that several monks made a repast on the roots of wild endive, amongst which were mixed by mistake two roots of Henbane. A few hours after having gone to bed, some of them experienced vertigoes, others a burning of the tongue, lips, and throat; there were some who experienced severe pains in the iliac region, and in all the joints: the intellectual faculties and the organs of vision, were perverted in others; they could no longer read correctly, without adding some words; they gave themselves up to actions that were mad and ridiculous. He who had eaten the most, and who before saw extremely well, no longer distinguished objects without the assistance of spectacles: they were cured by the distilled water of Juniper-berries.†

4th. A man and his wife, deceived by the sweetness of the black Henbane root, ate some of it. They felt at first, a difficulty of swallowing, after which they became phrenetic and stupid; these symptoms disappeared spontaneously. *Lindern* has seen a similar imprudence followed by extravagant gestures, delirium, sleep with snoring, and in the end, death. (Vicat, Op. citat. p. 200).

5th. *Boerhaave* experienced a trembling and drunkenness, in consequence of preparing a plaster, into the composition of which entered Henbane.

6th. *Potovillat* asserts, that nine persons took some soup, in which had been boiled some black Henbane root instead of parsnips. Some of them lost their speech, and the whole were agitated by convulsive movements; they experienced dis-

* *Traité de Médecine Légale*, already quoted, tom. iv. p. 25, 2nd Edition.

† Wepfer, *Cicutæ Aquaticæ Historia et Noxæ*, p. 232.

tortion of the mouth and of the limbs, *risus sardonicus*, and a horrible madness. When they were restored by appropriate remedies, they saw objects at the first moments double, then they appeared to them of a scarlet colour.*

7th. *Grunwald* has seen the decoction of the leaves of this plant, administered in a glyster, give rise to a furious delirium.† Several practitioners have remarked symptoms of poisoning after the administration of a glyster prepared with the extract of this plant.

875. It results from the facts delivered:

1st. That the juice and decoction of the root of black Henbane in full vegetation, produce serious symptoms when introduced into the stomach; but that their effects are less if employed in the beginning of the spring.

2nd. That the juice of the leaves is less active.

3rd. That the watery extract obtained by evaporating in a water-bath the juice of the fresh plant in full vegetation, possesses nearly the same poisonous properties as the juice, whilst it is incomparably less active when obtained by decoction of the plant not sufficiently developed, or too much dried, which explains why *certain extracts of Henbane found in commerce are endued with no virtue.*

4th. That these preparations act nearly in the same manner, whether applied upon the cellular texture, introduced into the stomach, or, in fine, injected into the veins: in this last case it requires but a very small quantity to produce death.

5th. That they are absorbed, carried into the circulation, and exert a remarkable action on the nervous system, which may be compared to a mental alienation, to which succeeds a remarkable stupefaction.

6th. That they do not produce inflammation of the texture.

7th. Lastly, that they appear to act in the same manner on the human species as on dogs.

* Philosophical Transactions, vol. xl. p. 446.

† GRUNWALD, *Ephemer. des Cur. de la Nat.* an. 9, App. p. 179.

876. The white Henbane *(Hyosciamus albus)* is likewise extremely poisonous.

Observations.

1st. When taken in the dose of twenty-five grains, it has produced lethargy, convulsions, *subsultus tendinum*, and insensibility; in another instance, its use destroyed the faculty of deglutition, produced delirium, and suppressed the voice: symptoms which, indeed, were not of long duration.*

2nd. The following fact was communicated to M. Fodéré, professor of the School of Medicine of Strasbourg, by Dr. Picard.

"In the month of April, 1792, a large quantity of Henbane was carried by mistake on board the French Corvette, *La Sardine*, which the sailors had gathered in one of the islands of Sapienzi in the Morea, where the vessel chanced to be. A part of it was put into the ship's coppers, and the remainder into those of some of the subaltern officers. At four o'clock they all dined. In a short time they experienced vertigoes, vomitings, convulsions, gripes, and copious stools; which, as they seized the whole ship's company, determined them to fire a gun, and make all the necessary signals for calling on board the absent boats. M. Picard arrived on board, and perceived the second gunner Ribergue, making a thousand grimaces and contortions, very much resembling the *Danse de Saint-Guy*. He ordered the plant to be brought to him, which had been employed, and recognized the *white Henbane*. He kept up the evacuations upwards and downwards, and used afterwards drinks with vinegar. Those who had no evacuations were for some time in a sickly condition, and struggled with a protracted convalescence; the others quickly recovered. It was necessary however to combine the most powerful anti-spasmodics with the evacuating plan, in order to restore *Ribergue* to perfect health." *(Médecine Légale,* already quoted, tom. iv. p. 23.)

* Hamilton, *Essays and Observations*, p. 243.

877. Golden Henbane (*Hyosciamus aureus*). *M. de Voilemont* has given the decoction of this root to dogs. "There comes on them," says he, "a trembling, and feebleness in the legs; old dogs are five or six days without eating or drinking, and in the end die. Young ones, on the contrary, drink excessively, eat scarcely any thing, and at the end of eight or ten days are in good health.

The *Hyosciamus Physaloides* and *Scopolia*, are equally poisonous.

OF THE PRUSSIC ACID.

878. The Prussic Acid, in the most concentrated form that it has hitherto been obtained, is a fluid colourless, transparent, and of an exceedingly strong smell, similar to that of the blossom of the peach, or bitter almond trees; its taste, which is at first cool, becomes acrid, irritating, and excites coughing; its specific gravity at 7°. is as 0,70583; it scarcely reddens the tincture of tournesol; exposed to the action of caloric, it boils at 26°5; it is capable of congealing at 15° below 0; the crystallization of this acid in its concentrated form may even take place when a few drops of it are poured upon paper; in this case, it becomes in part volatile, absorbs caloric from the portion not volatilized, which by that means becomes congealed.* It inflames in the atmosphere on approaching a body in a state of combustion; it is little soluble in water; is easily dissolved by alcohol; it gives with the Nitrate of Silver a white precipitate. Combined with Potash and Oxyde of iron, it furnishes a double salt of a lemon

* Several of these properties were not ascertained by the illustrious chemist *Scheele*, the discoverer of this acid. They will be found described at length in a very excellent Memoir of *M. Guy-Lussac*, who first succeeded in depriving the Prussic Acid of a very great quantity of the water with which it was combined, when prepared according to the process of *Scheele* (Vide *Annales de Chimie*, tom. lxxvii, p. 128.)

colour, which dissolves in water, and the solution of which throws down in a blue precipitate, more or less deep, the salts of iron of the second and third degree of oxydation; in a crimson, inclining to brown, the salts of copper at maximum; in a blood colour the salts of Urania; and in an apple-green those of Nickel.

ACTION OF THE PRUSSIC ACID UPON THE ANIMAL ECONOMY.*

Experiment 1st. A small bitch was made to swallow two drops of Prussic Acid. Immediately after, her breathing became accelerated, she staggered, fell, passed abundance of urine, and vomited twice; in a short time after, she was restored to health. Five hours afterwards, she was made to take eight drops; and the animal in a short time experienced the following symptoms: cough, salivation, accelerated respiration, staggering; weakness of the posterior extremities, plaintive cries, alvine evacuations, falling down, opisthotonos, dilatation of the pupil, tetanic stiffness, and, in less than five minutes, paralysis, first of the posterior limbs, then of the anterior; general insensibility, except in the tail, which was agitated from time to time; pulse accelerated, from seventy-two to a hundred and fifty pulsations per minute; great mobility of the eyes and eye-lids; at length, sleep. Fifteen minutes after, the animal rose up, passed some urine, experienced an opisthotonos, and in half an hour was recovered. The next morning the animal was again made to swallow sixteen drops of the same poison. Instantly, respiration accelerated, very strong cries, convulsions, opisthotonos, then emprosthotonos; its fore paws placed above the head, general tetanus, pupils dilated, ears cold, urine copious, general paralysis, tongue hang-

* These experiments were made with Prussic Acid, prepared according to the process of *Scheele*, and consequently containing a great deal of water.

ing out, eyes fixed, eye-lids moving. Five or six minutes after, respiration difficult, trismus, *subsultus tendinum*. At the end of half an hour, she rose up, and appeared to suffer pain in the belly; was frightened at the least noise, sought dark places, and was all in a tremor. An hour after, she ate with voracity.

Experiment 2nd. When thirty or forty drops of Prussic Acid are administered to dogs or to cats; they utter cries more or less strong, are agitated by convulsive movements, and die six, twelve, or fifteen minutes after the ingestion of the poisonous substance. On opening the bodies, no lesion is discovered in the digestive canal; the right ventricle of the heart is still contracting at the end of twenty or five and twenty minutes, whilst the left no longer exercises any motion; the veins contained in the thorax and abdomen, liver, kidneys, right auricle and ventricle of the heart, are distended with blood; the whole arterial system is empty; the lungs are more or less spotted; the brain appears in its natural state; sometimes it is somewhat softer, and the vessels of its base rather distended; the muscles are pale, and irritable for some time by Galvanism.

Experiment 3rd. Twenty-seven drops of this acid, being injected into the anus of a small cat, produced some vomitings and convulsions; this last symptom was more intense when twenty-seven drops of the same poison were injected into the abdomen; vomitings and convulsions were likewise produced by its injection into the synovial capsule of the knee, and into the vagina.

Experiment 4th. The Prussic Acid, brought in contact with the *dura mater*, or with the nerves of the arm, produced no serious symptom; the same took place at the tarsal articulation of a cat, strongly secured above the knee, and plunged for some time into this acid.

Experiment 5th. Twenty drops of Prussic Acid intro-

duced into the stomach of a rabbit, killed it in three minutes. These animals die still more speedily when a few drops of this poison are injected into the jugular vein. After death, the heart and auricles were found insensible to the concentrated acids and to puncture; the muscles of the breast were trembling when cut; the stomach exhaled the odour of the Prussic Acid; the intestines preserved their peristaltic motion; the blood was fluid.

Experiment 6th. Sparrows expire within one, two, four, or five minutes, amidst convulsions more or less violent, when a single drop of this acid is injected into their beak, or introduced into the anus. It is sufficient even to hold the animal over the mouth of the bottle which contains the acid.* A duck was killed speedily with fifteen drops.†

Experiment 7th. Frogs die within one or two hours after having swallowed fifteen, eighteen, or twenty drops of Prussic Acid: a short time after the ingestion of this poison, they lose insensibly their strength, shut their eyes, lay down their heads upon the floor. A little before death, they swell, extend, and move their phalanges, contract their posterior extremities, and become insensible. On dissection, a great quantity of reddish serosity was found in the abdomen, a tolerable quantity also of a white viscous fluid in the mouth and in the stomach, a little air in the lungs; the heart continued to beat more than two hours, notwithstanding the repeated application of the Prussic Acid upon it. The contractions of this organ cease altogether at the expiration of half an hour, when it is separated from the trunk, and plunged, three times, into the Prussic Acid. *(Coullon.)* This

* Schrader, *Journal Allemand par M. M. Yellen et Promsdorff*, second extract, vol. xxi, 1st. number, 1st. letter.

† Coullon, D. M. P. *Dissertation Inaugurale sur l'Acide Prussique.* Aug. 20th, 1808. This thesis contains a very great number of interesting facts.

fact agrees with the experiments of the celebrated Fontana,* in which the heart of several frogs ceased to contract when a few drops of the cherry laurel were let fall upon them.

These animals die also when the Prussic Acid is applied upon their eyes, or injected into the anus, or into the abdomen.

Experiment 8th. A carp was made to swallow twenty-four drops of Prussic Acid; sensibility was extinguished imperceptibly, and the animal died at the end of an hour. The mouth remained open; the heart contracted immediately after death; but the auricle gave no sign of motion. A pike, placed in water containing a few drops of Prussic Acid, died in an hour and half; he agitated himself greatly in the water. *(Coullon.)*

Experiment 9th. Snails, *helices aquaticæ*, and slugs, die from the contact with the Prussic Acid; but death takes place later in some other animals. Leeches, earth-worms, crabs, lobsters, scolopendræ, spiders, lice, fleas, flies, bugs, (both of the beds, and such as are found in woods) bees, wasps, ants, crickets, grass-hoppers, vibriones, equally lose their lives at the end of a space of time which is variable, when brought in contact with this poisonous substance, and exhibit symptoms more or less similar to those we have been describing. *(Coullon.)*

Experiment 10th. Professor *Emmert*, who had published, as early as 1805, an excellent treatise on the effects of the Prussic Acid, asserts, that a crow died a few seconds after the injection of half a drachm of this acid into the trachea; it exhibited all the phenomena of opisthotonos. †

Experiment 11th. The same physiologist injected into the jugular vein of a horse some warm Prussic Acid, and he remarked that, a few minutes after, the breathing was more

* *Traité du Poison de la Vipère.*

† *Dissertatio Inaug. Med. de Venenatis Acidi Borussici in Animalia Effectibus.* C. F. Emmert, *Tubingæ*, 1805.

frequent, convulsive movements took place in all the muscles of the body, and the pupil was dilated. The animal died twenty-one minutes after the injection. The blood drawn from the animal after the injection coagulated without producing any crust, whilst that drawn before the operation had one; there were bubbles of air in the heart.

Experiment 12th. *M. Robert* has exposed successively birds, rabbits, cats, and dogs, to the aperture of a matrass of the capacity of two *litres*, containing air mixed with Prussic Acid Gas; all these animals died in the course of two, four, six, eight, or ten seconds, opening their jaws, and rendering a great quantity of saliva. A very strong dog, submitted to one of these experiments, presented after death, the following results: brain sound, exhaling the odour of Prussic Acid; tongue soft, bluish, and hanging out of the mouth; bloody mucosities in the ventricles of the larynx; mucous membrane of the trachea scattered over with reddish streaks; the capillary system was injected; lungs of a bright red; aortic cavities of the heart filled with blood of a deep red colour; that contained in the aorta and its principal divisions was also of the same colour; the venous blood had the appearance of a fluid in which some liver had been dissolved; the lungs, heart, and blood, exhaled the odour of Prussic Acid; the same phenomena appeared in the liver and muscular flesh; no alteration in the abdominal organs.

Experiment 13th. *M. Robert* has also caused dogs and cats to swallow Prussic Acid dissolved in water and in alcohol, and obtained results similar to those we have described in the foregoing experiments.*

Observations.

1st. *M. Coullon* says, page 39, "I have swallowed successively twenty, thirty, forty, fifty, sixty, eighty, and eighty-

* *Annales de Chimie*, month of October, 1814.

six drops of Prussic Acid in as much water. I found this liquor of an intolerable bitterness. I felt nothing at the first doses; it was only at the last that I observed what follows; after taking them, I had instantly, for a few minutes, an increased secretion of saliva, and two or three slight retchings; my pulse, which before this was beating fifty-seven or fifty-eight pulsations per minute, gave very sensibly, at the end of ten minutes, seventy-seven and seventy-eight; but in the course of an hour and a half it returned to its former standard. I felt, during a few minutes, a heaviness of the head, and slight cephalalgia, which appeared to be seated under the hairy scalp of the sinciput. For more than six hours, I experienced a very remarkable anxiety of the præcordia, alternating with a slight pulsative pain in this part, which was not rendered more sensible by pressure."

2nd. My friend *M. Fueter* communicated to me the following fact, which has since been inserted in the *Annales de Chimie* of the month of October, 1814. M. B., Professor of Chemistry, left from forgetfulness a flask containing alcohol saturated with Prussic Acid; the servant girl, seduced by the agreeable smell of the liquor, swallowed a small glass of it. At the expiration of two minutes, she fell dead, as if she had been struck with apoplexy. The body was not opened.

3rd. *Scharinger*, Professor at Vienna, prepared, six or seven months since, some Prussic Acid pure and concentrated; he diffused a certain quantity of it upon his naked arm, and died a short time after.

OF THE LAUREL (*PRUNUS LAURO-CERASUS* OF LIN. OR BETTER *CERASUS LAURO-CERASUS*).

879. This shrub belongs to the genus *cherry-tree* of the family of the *Rosaceæ* of Jussieu.

Calyx bell-shaped, caducous, with five lobes: corolla of

five petals: fruit fleshy, round, smooth, somewhat furrowed on one side; stamina of indeterminate number; flowers in a pyramid, white, but not very bright: bark smooth, of a greenish brown colour: leaves permanent, simple, entire, oblong, firm, shining, petiolated, sometimes variegated with white, sometimes with yellow, furnished with two glands on the back, or on their inferior surface. This shrub grows spontaneously near the Black Sea, in the neighbourhood of Trebisonde. It is cultivated in gardens; its flowers and leaves have the flavour of the bitter almond.

ACTION OF THE DISTILLED WATER OF THE LAUREL ON THE ANIMAL ECONOMY.

The distilled water of the Laurel contains Prussic Acid. *Schrader* has witnessed *(memoir already quoted)* that in pouring it upon a ferruginous salt, a blue precipitate of Prussiate of iron was obtained by the addition of a few drops of an alkali, and of any acid except the Nitric or the Nitro-muriatic. *Bohn, Bucholz, Roloff,* and *Gehlen,* have also recognized in it the presence of this acid.

*Madden,** *Mortimer,*† *Browne-Langrish,*‡ *Nicholls,*§ *Stenzelius, Heberden, Watson, Vater,*‖ *Rattrai,* the *Abbé Rozier, Duhamel,*¶ and *Fontana,*** have successively made experiments on the deleterious properties of this fluid. We have also tried ourselves a very great number: the following are the principal results.

Experiment 1st. A wound was made in the back of a little dog; an ounce and half of distilled Laurel-water, were

* Letter in the Philosophical Transactions, an. 1713.

† Idem.

‡ Browne-Langrish, *Expériences de Médecine sur les Animaux.*

§ Vid. *Œuvres Physiques et Médicales de* R. Mead, article *Opium.*

‖ *Dissertatio de Lauro-cerasi.*

¶ *Traité des Arbres et des Arbustes.*

** *Traité du Poison de la Vipère.*

injected into the cellular texture. At the end of half an hour the animal vomited a tolerably large quantity of alimentary matter. Three minutes after, he threw up by the mouth some greenish, glutinous, and frothy matter. Thirty-five minutes after the operation, he made several circular turns in the laboratory; his head seemed to be heavy; his extremities grew feeble, first the posterior, then the anterior ones; he could scarcely support himself. Five minutes more had scarcely elapsed when he fell down upon the side, reversed his head upon his back, and his paws were agitated with slight convulsive motions: he might be moved like an inert mass of matter, and was incapable of standing; his breathing was difficult and accelerated; he preserved the use of his senses. Ten minutes afterwards he uttered very acute plaintive cries. These symptoms continued till death, which took place an hour and half after the application of the poisonous substance. Sensibility had diminished by degrees in the organs of sight and hearing.

Dissection. The vessels of the superior surface of the brain were black, very much distended, and gorged with blood; there was no fluid in the ventricles of this organ; the lungs were more red than in their natural state; the digestive canal presented no sensible sign of alteration.

The same experiment repeated upon a stronger dog furnished the same results.

Experiment 2nd. *Fontana* opened the skin of the abdomen of a large rabbit; he slightly wounded the muscles, into which he introduced about two or three tea-spoonfuls of this water. In less than three minutes the animal fell into convulsions, and soon after died. (Op. citat. p. 127.)

Experiment 3rd. Four ounces of this fluid were injected into the stomach of a very strong dog, and the œsophagus was tied. At the end of three minutes, vertigoes, staggering, weakness of the posterior extremities, falling upon the side, and reversing the head upon the back; free use of the senses;

a moment after he made an effort to stand on his feet, stood up for two minutes, walked, staggered, and fell again; then the breathing became accelerated, the head projected forwards; the limbs were agitated with convulsive movements; the animal made no resistance; on the contrary, was in a state of insensibility; the senses no longer performed their functions. Four minutes after the attack, he lay down upon the back, separated the hind legs, which were greatly elongated, breathed with difficulty; the pulsations of the heart regular and frequent, the tongue rose-coloured, the head in the natural position; the convulsive movements continued to be very slight; the agitation and the shock produced no tetanic stiffness; the tail was trembling. Eighteen minutes after the ingestion of the poison, the animal appeared to be dead; he was motionless. He expired in this state, at the end of six minutes. The body was immediately opened. The blood contained in the left ventricle was red; it was fluid in all the vessels, and in all the cavities; the lungs were rose-coloured, crepitating, and not distended with blood; the digestive canal was sound; some food was found in the stomach; the ventricles of the brain contained neither serosity nor blood; the internal vessels of this organ were injected.

Madden relates three experiments in which the dogs took the same poison, the œsophagus not having been tied; and the same symptoms were observed as those we have described above; two of these animals vomited, and one of them recovered after having had convulsions for ten minutes.

Experiment 4th. When injected into the rectum in the dose of one or two ounces, this fluid produces the same symptoms, and death supervenes ten, twelve, or fifteen minutes after. *Madden* has however observed, that, in this case, there were violent convulsions, more especially in the muscles of the neck and spine, tetanus of the extremities, and foaming at the mouth. *Mortimer*, Secretary of the Royal Society of London, reports that, in some of the experiments made with

this poison, the rectum and liver have been found inflamed, and the latter of these organs was almost livid; the lungs were shrivelled, red, and inflamed. Sometimes also about a spoonful of water has been found in the pericardium.

Experiment 5th. *Browne-Langrish* gave to a dog labouring under a fistula a chopine of water distilled from laurel leaves; the animal instantly experienced the phenomena above described, and the discharge from the fistula was suppressed. The next day he was made to swallow the same dose of the poison; the same symptoms took place, with a copious sweating in the beginning. The experiments were suspended for three days, and the running re-appeared; on the fifth day, three chopines of the fluid were given him, and he died in four minutes and a half.

Experiment 6th. *Fontana* caused some eels to swallow some distilled water of laurel; immediately after, these animals contracted themselves; then remained motionless and insensible to every mechanical agent; the heart still beat a little, and ceased to contract sooner than when the head is cut off; lastly, they died in a few seconds.*

Experiment 7th. Three drachms of this fluid were injected into the jugular vein of a strong dog; the injection was scarcely terminated, when the animal fell down on his side; the head was reflected upon the back, and the extremities agitated by slight convulsive movements; the mouth was foaming; respiration impeded, and accelerated; the organs of sense were insensible. At the expiration of four minutes, he attempted to rise, but fell down again; the head then was in its natural position: at one time the animal brought it a little forward upon the thorax, at another reflected slightly towards the back; the muscles of the face and eyelids presented at intervals convulsive movements not very severe. Ten minutes after, the breathing was again accelerated and rendered difficult,

* Fontana, Op. citat. p. 128.

the tongue red, the conjunctiva injected, the organs of sense began to recover their sensibility. At the end of five minutes, the animal appeared in a profound sleep; he was placed on his feet; he bent them in lying down on the belly; his head trembled greatly, he moved it about from side to side, and endeavoured to raise it up a little; but it was heavy and fell down: the animal then lay down upon his side; there were no more convulsions in the limbs; the organs of sense had recovered their sensibility. Twenty minutes after the injection, most of the symptoms had decreased in violence; the animal was capable of standing and walking; he staggered however a little, the trembling of the head had disappeared; respiration was performed as in health: in fine, a quarter of an hour after, he preserved only a very slight tendency to drowsiness; at the end of two days he ate heartily. The day after, he was perfectly recovered.

Experiment 8th. Three drachms and a half of the same fluid were injected into the jugular vein of a small strong dog, the animal instantly appeared stupified, to that degree that he was considered dead: the pulsations of the heart were rare, respiration almost suspended. He expired two minutes afterwards. The body was instantly opened. The blood contained in the left ventricle was fluid, and of a less bright red colour than in its natural state; the lungs were rose-coloured and crepitating.

These two experiments, the correctness of which we can vouch for, do not agree with those of the celebrated Fontana, who says, that he observed no deleterious effect from injecting into the jugular of two rabbits, a good tea-spoonful of this poisonous substance. (Op. citat. p. 131.)

Experiment 9th. *Browne-Langrish* injected four ounces of the same fluid into the abdomen of a dog; the animal experienced the symptoms described above; and died twenty-two minutes after.

Experiment 10th. *Fontana* laid bare the sciatic nerve of a

large rabbit; he wounded it with a lancet, and covered the whole extent that had been wounded with lint, moistened with fifteen drops of distilled laurel-water; he afterwards so disposed the parts that the poisonous substance could not communicate itself to any thing in the neighbourhood of it; the wound was then brought together by suture, and the animal did not appear in any way incommoded. (p. 129.)

OBSERVATIONS.

1st. "A woman, after making a quantity of Laurel-water, gave a bottle of it to *Martha Boyce*, her servant, who carried it to *Anne Boyce* her mother, as an excellent cordial. This latter made a present of it to *F. Eaton*, who gave two ounces of it to regale *Mary Whaley*, who only drank two thirds of it, then went away: *F. Eaton* drank the rest. The former, going into a shop, complained of a violent pain of the stomach; she was carried home, and from that moment lost the use of her speech, and died in an hour and a half, without vomiting, convulsions, evacuations, or any external change. *A. Boyce*, when informed of this accident, would not believe it; and, to prove that it was an excellent cordial, she poured out into a glass three spoonfuls, which she drank, and a few minutes after swallowed two more, so much was she persuaded of its virtue; but she died in a very short time without making the least complaint, and without convulsions. *F. Eaton*, who had taken but little of it, escaped death by an emetic."*

2nd. *Douellan* gave to a relation, whose heir he was, a medicine containing Laurel-water: the unfortunate patient experienced convulsions, foamed at the mouth, had the jaws locked, and the eyes fixed: he expired an hour after.†

3rd. *M. Fodéré* says: "whilst I was attending my studies at Turin, in 1784, the chamber-maid, and man-servant of a

* *Philosophical Transactions*, year 1731. Letter of Madden.

† *London Chronicle*, 1718. No. 3,797.

noble family of that town, stole, for the purpose of regaling themselves, from their master, a bottle of distilled Laurel-water, which they took for an excellent cordial, which was kept locked up for the sake of preserving it. Fearful of being surprized, they hastily swallowed, one after the other, several mouthfuls of it; but they paid in a short time the price of their dishonesty, for they expired almost instantly in convulsions. The dead bodies having been carried to the University, they were examined; the stomach was found slightly inflamed, and the rest in a sound state."*

4th. In 1728, two women having taken of this fluid, one to the dose of ten drachms in an hour's time, the other of two table-spoonfuls, the first lost the use of speech, experienced a painful sensation in the stomach, and expired without vomitings, stools, or convulsions; the second sat down on a chair, and died immediately after, without convulsions, or any other apparent commotion.

A young man died in a few minutes after having drank a part of the distilled Laurel-water contained in a phial: he experienced a severe affection of the stomach.†

OF THE OIL OF LAUREL.‡

Experiment. A drachm of this oil was mixed with six pounds of common water; the whole was shaken up together, and two ounces of the mixture were administered to a dog; the animal was paralyzed to that degree, that he was no longer sensible of the irritation of any agent whatever. He died in half a minute.§

* *Médecine Légale*, already quoted, tom. iv. p. 27, 2nd edition.

† Murray, *Apparatus Medic.* tom. iii. p. 213.

‡ This oil had been prepared by drawing over again and again, three or four times, the distilled water upon fresh leaves.

§ Nicholls. Vide *the Medical Works of Richard Mead, Laurel-water*, p. 139. anno 1765.

Duhamel relates, *(Traité des Arbres et Arbustes de la France)* that he was near being suffocated by the strong smell of bitter almonds, which escaped on opening the body of a dog killed by this poison.

Fontana prepared an oil by distilling the leaves of the Laurel in vessels of glass without the addition of water. He administered two, three, and four drops of it to rabbits, tortoises, pigeons, and frogs, which died in a very short time after, and which exhibited symptoms similar to those we have been describing.

OF THE WATERY EXTRACT OF LAUREL.

Experiment 1st. A wound was made in the inside of the thigh of a dog : a drachm of this extract was injected into the cellular texture. Ten days after, the animal was living, and had felt no other symptom than loss of appetite.

Experiment 2nd. The same experiment was repeated upon a small dog, with two drachms and a half of the same extract. Four and twenty hours after, the animal had experienced nothing ; he walked about extremely well ; he was nevertheless somewhat dejected. He died forty-eight hours after the operation. The heart, lungs, and digestive canal appeared sound ; the wound was very little inflamed.

Fontana administered about thirty grains of this extract to a guinea-pig and a rabbit : they were not incommoded by it. Fifteen grains administered to several pigeons were also without effect. (Op. citat. p. 155.)

ACTION OF BITTER ALMONDS ON THE ANIMAL ECONOMY.

Experiment 1st. A cat, two months old, swallowed a drachm of bitter almonds pounded. In a short time after, it dragged along its hind legs, became paralytic, and experienced

four attacks of epilepsy. In the evening, the respiration became panting, and it died. The stomach was red at its orifices, and contained mucus: the heart and auricles were filled with fluid blood; there was an effusion of blood throughout all the right side.

Experiment 2nd. Some pigeons were made to take somewhat less than a drachm of bitter almonds pounded; they walked about for a few minutes; but in a short time their crop and their neck swelled out, their feathers became erect, at length they fell down as if epileptic; their heads were reflected upon the back; they remained motionless, and senseless, and soon expired. The œsophagus was found somewhat inflamed, very much dilated, and full of mucus; the duodenum contained chyle, viscid and yellow; the blood in the subaxillary vessels was fluid, and of a vermillion colour; the cerebellum was distended with blood; the lungs appeared sound. (Wepfer, *De Cicuta Aquatica*, pp. 239 and 241.)

These experiments have been successfully repeated by *M. Gerard*, professor of the *Ecole Centrale* of the Lozère.

Foxes, squirrels, cocks, fowls, cranes, ducks, canary-birds, weazels, are killed by these almonds, according to the facts reported by *Dioscorides, Foenisius, Matthiolus*, and *Tabernæmontanus, Vicat, M. Deyeux*, &c. &c.

Experiment 3rd. Twenty bitter almonds were introduced at noon into the stomach of a small robust dog, each of them cut into three pieces: the œsophagus was then tied. At the end of an hour and half, the animal began to experience vertigoes, and weakness of the posterior extremities. He died at six in the evening. The *Dissection* took place an hour after. The animal was still warm; the heart no longer contracted, and contained a very small quantity of blood; the lungs were grayish, the stomach, which was sound, contained the fragments of the almonds, and exhaled a strong smell of Prussic Acid, whilst, before the ingestion, these seeds were devoid of smell; the duodenum was lined with a substance

similar, for its texture and colour, to the yellow matter of the bile; no lesion was perceived in the digestive canal.

Experiment 4th. A small dog was made to swallow six bitter almonds which had been coarsely pounded. At the expiration of an hour, he vomited them, and was perfectly recovered. The next day, the same experiment was repeated with the same number divided each of them into two portions, and the œsophagus was tied. Four hours after, the animal had experienced nothing. He did not die till the end of the fourth day, and then in a state of great dejection. The body was not opened.

Experiment 5th. Six bitter almonds grossly powdered were applied to the cellular texture of the thigh of a dog of middle size. Thirty hours after, the animal did not exhibit any remarkable symptom, and he did not die till the end of the fourth day.

880. Every thing tends to induce a belief that the leaves of the peach-tree, fruits with kernels, the pips of apples, and the different bodies containing Prussic Acid, exert on the animal economy, a deleterious action more or less considerable.

881. It results from these facts:

1st. That the Prussic Acid is hurtful to the different classes of animals, more to those which have warm blood, than to the others; insects however die approaching to animals with warm blood by the promptitude with which they are frequently seized; but receding from them by the inverse order in which the parts die.

2nd. That it produces death so much the more rapidly as the circulation is more active, and as the organs of respiration are of greater extent.

3rd. That it is more pernicious to young animals than to others.

4th. That it exerts its action upon whatever texture it may be brought in contact with, the nerves and dura mater excepted.

5th. That the intensity of this action varies according to the part upon which it is applied; thus for instance, it is extremely deleterious when injected into the jugular vein or into the trachea *(Emmert)*; it is less so when injected into the thorax; still less when introduced into the stomach or rectum; its action is still more weak when applied to wounds, and death takes place sooner when the wound has been made on the anterior limbs. *(Emmert.)*

6th. That if the dose be not sufficiently strong to procure death, the animal returns very speedily to life, more especially if the poison has been brought in contact with the eye, or with the stomach.

7th. That its effects depend on its being absorbed and carried into the circulation.

8th. That its action is retarded, but not suspended, when it is brought in contact with a part which no longer communicates with the brain or spinal marrow.

9th. That it appears to act on the human species as on the warm blooded animals.

10th. That it destroys the irritability, and ought to be classed amongst the narcotics.

11th. That it does not produce any inflammatory lesion capable of being demonstrated after death; nevertheless, that the venous system appears distended, whilst the arteries are empty, the pupils frequently dilated, the lungs spotted; alterations which are common to a very great number of the stupifying poisons.

882. It is evident that the distilled water and oil of Laurel, as well as bitter almonds, exert a mode of action analogous to that of Prussic Acid.

The watery extract of Laurel is not poisonous, or very little so, which doubtless depends on the Prussic Acid being volatilized during the evaporation of the fluid, to the consistence of an extract.

OF THE STRONG SCENTED LETTUCE (*LACTUCA VIROSA*).

883. This plant belongs to the Syngenesia Polygamia Æquales of Lin. to the family of the *demi-flosculeuses* of Tournefort, and to the order of the *Chicoraceæ* of Jussieu.

Characters. Flowers compound, yellowish, disposed in small clusters, not very thickly furnished; calyx common (involucrum) imbricated, and formed of scales straight and elongated, pointed, unequal, membranous on the edges; semi-floscules hermaphrodite, ligulated, and dentated: receptacle smooth, pointed: seeds oblong, compressed, and crowned each by a tuft pedicellated, capillary, soft and fleeting: stalk straight, whitish, covered with scattered prickles, and furnished towards the superior part with branches alternate and slender; inferior leaves oblong, oval, amplexicaul, auriculated at the base, unequally dentated, and thorny on their upper side; the superior are arrow-shaped and entire, having only a few teeth almost thorny at their lobes. All the parts of this plant contain a milky juice, viscid, bitter, and of a bad smell. It is found in the fields, hedges, and sides of walls.

ACTION OF THE STRONG SCENTED LETTUCE ON THE ANIMAL ECONOMY.

Experiment 1st. A strong dog was made to swallow about a pound and half of the leaves of strong scented Lettuce: the animal did not appear to be incommoded.

Experiment 2nd. Two drachms of the watery extract of strong scented Lettuce, bought of an apothecary, were applied to the cellular texture of the back of a dog. Five days after, the animal experienced such vertigoes that he could not stand; he had all along refused food, but had not experienced any

remarkable symptom. He died the same day. No sensible alteration was perceived in the internal organs.

Experiment 3rd. The same experiment was repeated upon a small dog. At the end of two days, the animal, who had only been slightly drowsy, had some slight vertigoes, and died seventy hours after the operation. The ventricles of the brain contained no fluid; the exterior veins of that organ were distended and injected with black: the lungs presented a few patches of a brown red colour; their texture was somewhat more dense than natural.

Experiment 4th. At half past seven in the morning, the same experiment was made upon a great robust dog, with two drachms of the extract of strong scented Lettuce, prepared by *evaporating in a water-bath the juice of the fresh plant.* The animal experienced nothing in the course of the day. At half past nine in the evening, he complained a little. At eleven, he began to experience vertigoes. The next morning at seven, he was found dead. He was opened immediately. The legs were extended, widely separated, and in a state of remarkable rigidity; the blood contained in the ventricles of the heart was black and coagulated; the lungs and digestive canal presented no perceptible alteration; the limb operated on was scarcely inflamed.

Experiment 5th. At eight in the morning, three drachms of the same extract dissolved in two ounces of water, were introduced into the stomach of a small dog, and the œsophagus was tied. The next day, at noon, no remarkable phenomenon had been observed. The animal died the following day, at six in the morning. The *dissection of the body* threw no light on the cause of his death.

Experiment 6th. Thirty-six grains of the same extract, bought of an apothecary, and dissolved in four drachms of water, were injected into the jugular vein of a dog of middle size. At the end of two minutes, the animal vomited some

half digested food; he ran rapidly over the laboratory, then stood still; the head was heavy; he appeared a little drowsy, and his posterior extremities began to grow feeble. Seven minutes after the injection, he experienced some vertigoes; staggered in walking; and, in two minutes more, fell on his posterior limbs; a few moments after, he lay down on the side. He saw and heard very well; his breathing was a little obstructed and accelerated. He remained six minutes in this state; he was then shaken; he made seven or eight steps without stumbling, and then fell down again; his head was reflected upon the back, his paws were agitated with slight convulsive motions, he uttered a few plaintive cries, made some fruitless efforts to vomit, and expired at the end of three minutes. He was immediately opened. The blood contained in the heart was fluid, without any alteration of its colour; the lungs were crepitating and rose-coloured, and contained only a small quantity of blood.

Experiment 7th. Forty-eight grains of the same extract, dissolved in three drachms of water, were injected into the jugular vein of a small robust dog. The animal was instantly put to sleep, passed a small quantity of yellowish excrement, fell down on the side, and expired three minutes after without shewing the least convulsive struggle. The *dissection* took place immediately. The heart was no longer beating; the blood contained in the left ventricle was red and fluid; almost the whole of that enclosed in the right cavity was coagulated and black: the lungs were rose-coloured, crepitating, and floated in water.

We read in *Vicat;* "The strong scented Lettuce intoxicates those who eat of it, or who respire the vapour arising from it whilst cooking. In a word, an opium as active as that furnished by the poppy may be obtained from it. (Op. citat. p. 209.) It is easy to perceive, that the assertion of this author is incorrect, by comparing the small degree of

activity of the extract of this plant with the energetic properties of Opium, and especially of its extract.

884. The facts just related lead us to believe,

1st. That the extract of the strong scented Lettuce, prepared by evaporating the juice of the plant by a gentle heat, is more active than that which has been prepared by decoction.

2nd. That it is absorbed and carried into the circulation, and that its action is more intense and more rapid when it is injected into the jugular vein, than when applied to the cellular texture of the thigh: this last mode of application is followed by effects more decided than when the extract is introduced into the stomach.

3rd. That it acts on the nervous system after the manner of the narcotics.

OF THE SOLANUM.

885. The experiments of *M. Duval* prove evidently, that the *Solanum Dulcamara* may be administered in a strong dose without any inconvenience. He administered to dogs as much as four ounces of its watery extract, without their having experienced any accident. The same thing happened to one of these animals that was made to take one hundred and eighty ripe berries of the *Solanum Dulcamara*. A cock, that swallowed fifty of them, did not seem at all incommoded. With the intention of understanding the influence of the state of maturity of these fruits, a dog was made to take a hundred berries of Dulcamara before they were ripe: they gave rise to no symptom. *M. Fages*, doctor of Montpellier, has employed the watery extract of Dulcamara, in a very strong dose, on a man affected with herpetic eruption. On the forty-seventh day of the treatment, the patient took daily, in one single dose, ten grains of the watery extract of Dulca-

mara. In another instance, this medicine was carried with impunity to thirty-two drachms, which was divided into two doses.*

The Nightshade *(Solanum Nigrum)* has likewise fixed the attention of *M. Duval:* he has given to porpoises, dogs, and cocks, from thirty to a hundred berries of *Solanum Nigrum* and of *Solanum Villosum,* without their having experienced the least inconvenience. He has eaten himself at different times a tolerably large quantity of these berries, without any accident. *M. Duval* is of opinion, from these facts, that the history of poisoning by the Nightshades, found in the works of *Gmelin,* of *M. Alibert,* and in the *Ephemerides des Curieux de la Nature,* belong rather to the fruit of the *Atropa Belladonna,* which was classed with the *Solana* by the botanists anterior to *Tournefort.* It is evident that the observation reported by *Wepfer (de Solano Furioso,* p. 222, *libr.* citat.) belongs also to the *Belladonna.*

886. We have made some experiments with a view to determine what was the action of the watery extract of Nightshade prepared by evaporating in a water-bath the juice of the fresh plant.

Experiment 1st. At seven in the morning, seven drachms and a half of this extract dissolved in three ounces and a half of water, were introduced into the stomach of a very strong little dog, and the œsophagus was tied. At four o'clock, the animal did not appear to have suffered any inconvenience. The next day, at eight in the morning, he was somewhat dejected. At five in the evening, he shewed no remarkable phenomenon. The day following, at six in the morning, he was insensible and motionless. He expired a quarter of an hour after. He was opened at half past seven. The limbs were flaccid, the heart contained no blood; the lungs pre-

* *Histoire Naturelle, Médicale, et Economique des Solanum,* par M. Duval, 1813, pp. 70, 73, and 99.

sented patches of a deep red, less crepitating than the other parts, which were of a rose colour; there was no alteration in the digestive canal.

Experiment 2nd. The same experiment was begun with six drachms of the extract on a small dog. The animal died at the end of forty-eight hours, and exhibited the same symptoms and the same lesions.

Experiment 3rd. At eight in the morning, two drachms of the same extract, dissolved in one drachm and half of water, were applied to the cellular texture of the thigh of a little dog. The animal died forty-six hours after, and had not exhibited any remarkable symptom during the first forty hours; he then fell into a state of great insensibility. On opening the body, the lungs were found slightly distended; the other organs were sound; the wound was very little inflamed.

887. These facts induce us to believe,

1st. That the extract of Nightshade is not very poisonous.

2nd. That it is slowly absorbed, and destroys sensibility and mobility.

M. Dunal has however observed, that the juice of *Solanum Nigrum, Villosum, Nodiflorum, Miniatum,* applied to the eyes, occasioned a slight dilatation of the pupil, and rendered the organ insensible to the impression of a bright light. (p. 88.) These effects continued for two, three, four, or five hours, and have constantly been less than those obtained by rubbing these same parts with the juice of *Belladonna.*

Solanum Fuscatum (Melangena Fructu Rotundo, cum Spinis Violaceis of *Tournefort).* A dog was made to swallow the pulp and seeds of fifteen berries of this species; the breathing very shortly became difficult; the muscles of the abdomen contracted and relaxed with some violence; the lips were quivering, the mouth foaming; the animal made fruitless efforts to vomit; the heat of the body was very much increased; and he threw himself from side to side. An hour and

a half after, he was more calm, and had vomited a great quantity of the poison: he was soon after perfectly recovered. (Dunal, p. 104.)*

Taxus Baccata (Yew). Different opinions have been advanced concerning the properties of this plant. *Ray, Berkley, Matthiolus, Bauchin, Julius Cæsar,* &c., affirm it to be poisonous. *Lobelius, Camerarius, Haller,* &c., are of a different opinion. *Bulliard* says; "I have several times swallowed the yew berries, after the example of the children, who give to this fruit the name of *Morviaux:* I have remained for a long time, and during the greatest heats, in places planted with yews recently trimmed: I have never experienced the slightest inconvenience from it." (Op. citat. p. 157.) We are of opinion that it ought to be ranked amongst the narcotics, and that the different opinions of authors on this subject arise from the circumstance of their having examined yews of different ages, and exposed in different places.

We have injected into the jugular vein of a large strong dog, forty grains of the watery extract prepared with the leaves of this plant, and dissolved in half an ounce of water. Two minutes after, the animal experienced vertigoes; his head appeared heavy; his posterior extremities began to bend. Five minutes after, he was asleep, and on the point of falling, when he was suddenly awoke. These symptoms diminished, and the next day the animal seemed to be recovered. The same experiment was again instituted on a dog of middle size, not so

* The beautiful memoir of *M. Dunal* is terminated by the following paragraph: "The facts which we have reported, are in opposition to the general opinion, which is, that all the *Solana* are poisons. The causes of this opinion are: 1st. That plants, extremely different to each other, have been confounded, by attributing to some of them the properties of others; 2nd. That it has not been remembered, that the properties of plants ought to be examined from organ to organ. 3rd. That the too general precepts of Linnæus have been believed without examination: *Plantæ quæ genere conveniunt etiam virtute conveniunt, quæ ordine naturali continentur etiam virtute propius accedunt.*"

strong as the former. He experienced the same symptoms, and died in the course of the night: no alteration could be perceived on dissection.

Actæa Spicata. *Linnæus* says, that the berries of this plant have excited a furious delirium, succeeded by death. *Colden* reports, that the ingestion of these fruits, and of a tincture prepared with the root of this plant, was succeeded by a considerable degree of anxiety and cold sweats, without however any other serious accident.* *Le Monnier* affirms, that its extract killed fowls. We have often given to dogs from four to six ounces of a decoction of *Actæa Spicata* gathered in the month of May, and have observed no sensible phenomenon.

Physalis Somnifera. *Plenck* ranks the root of this plant amongst the narcotics, and asserts, that it has less of deleterious properties than Opium.

Azalea Pontica. *Gmelin* reports, that the honey gathered from the flowers of this plant, produced in ten thousand Greek soldiers vomitings, dysentery, and intoxication; and they became mad.

Ervum Ervilia (Lentil). *Binninger* has remarked that the bread, into the composition of which the seed of this plant entered, had so much weakened the inferior extremities of the persons who had eaten of it, that they were obliged to walk supported by two crutches.† *Valisneri* has seen incurable palsies produced by this food.‡ Horses and fowls experience similar phenomena from this seed.

Lathyrus Cicera. The seeds of this leguminous plant possess nearly the same poisonous properties as those of the preceding, according to *Divernoi.*

Plenck classes also the *Peganum Harmela* amongst the narcotics.

* Colden, *Act. Upsal,* anno 1743, p. 132.

† *Observ. et Curat. Med.* cent. v. obs. lxx. p. 571.

‡ *Galera di Minerva,* tom. iv. p. 230.

Paris Quadrifolia. It is believed that this plant occasions vomiting and spasms. *Gesner* swallowed a drachm of it in wine and vinegar: he had copious perspirations, and experienced a dryness in the throat. (GESNERUS, 1st. *Epist.* Med. fol. 53.)

Saffron is looked upon by some physicians as a narcotic poison. We have instituted some experiments, which prove that it is not deleterious to dogs, or at least, that it is only so in a very small degree: 1st. Three drachms of Saffron, that had been infused in water for twelve hours, were introduced in the stomach of a small dog: the infusion was also ingested, and the œsophagus was tied. Five days after, the animal had not experienced any remarkable symptom; he was a little dejected. He died the following day, and it was impossible to discover the slightest alteration on dissecting the body. A drachm of Saffron, mixed with two drachms of water, was applied to the cellular texture of the thigh of a small feeble dog. The animal died at the end of the fourth day, and had shewn no other symptom than dejection. The opening of the body threw no light on the cause of his death.

OF AZOTIC GAS.

888. Azotic Gas is without colour or smell, and transparent. It extinguishes bodies in the state of combustion: its specific gravity is, as 0,96913: it does not redden the infusion of tournesol: it is insoluble in water, and produces no turbidness with lime-water.

ACTION OF AZOTIC GAS ON THE ANIMAL ECONOMY.

Experiment 1st. Guinea-pigs, when plunged into this gas, are asphyxied at the end of five minutes. They die in three minutes and a half if the experiment be begun by emptying

the lungs of the air that may be contained in them, as *M. Nysten* has proved. At the moment of immersion into an atmosphere of Azote pure, or almost pure, the animal experiences a difficulty in respiration, which becomes great, elevated, and more rapid than ordinary: it grows gradually weak, but without any lesion of the nervous functions. (*M. Dupuytren.*) After death the arterial system is found filled with black blood. This asphyxia only takes place through a defect of oxygen, as young animals can be easily restored to life by exposing them to the air.

Experiment 2nd. *M. Nysten* has injected into the jugular vein of several dogs, from twenty to one hundred and fifty centimetre cubes of Azotic Gas, and observed the following symptoms. Cries expressive of pain, convulsive stiffness of the limbs and trunk, agitation, pulse rare, and hardly perceptible, slow respiration, and death. *M. Nysten* concludes from these experiments that Azotic Gas, injected into the veins, exerts a sedative action upon the vital force of the heart, an action which is independent of another entirely mechanical one which it exerts on this same organ.

Experiment 3rd. The same physiologist has injected into the pleura of a dog one hundred and fifty centimetre cubes of this gas, which has been absorbed, and produced no hurtful effect.

M. Dupuytren has proved that this gas is one of the causes of the *Plomb*,* or asphyxia arising from privies.

OF THE PROTOXYDE OF AZOTE *(OXIDULE D'AZOTE).*

889. This gas is invisible and without smell; it has a sweetish taste; its specific gravity is, as 1,3693. It is soluble in

* This name is given by French writers to a disease common to night-men while employed in emptying privies; it consists of a suffocation and lypothymia, which quickly proves fatal, if not speedily relieved by an emetic, as is their practice.—TRANSLATOR.

water. When brought in contact with a taper presenting a few ignited points, it lights it instantly, and causes it to burn with brilliancy: in this case the gas is decomposed, and the Azote set at liberty.

890. The effects of this gas on the animal economy have not been the same in the different persons who have respired it. *M. H. Davey* experienced at first a giddiness, a pricking sensation at the stomach; towards the end of the experiment, the muscular force increased, and a sort of lively delirium took place, which finished by bursts of laughter. *M. Proust* felt only a stupefaction, and an inexpressible uneasiness. The experiments tried at Toulouse by a society of amateurs, confirm the results obtained by *M. Davey;* some persons however, far from experiencing gaiety, felt a great dilatation, accompanied with heat of the chest; their veins swelled, the pulse became accelerated, and objects appeared to turn round with them. *M. Psaff*, in giving an account of the experiments recently made at Kiel, says; "One of the persons who respired this gas was very quickly intoxicated, and thrown into a very extraordinary and extremely agreeable ecstacy." We have likewise undergone an experiment of this kind: the Protoxyde of Azote on which we operated was perfectly pure, and we were quickly obliged to suspend the experiment: vertigoes, an inexpressible uneasiness, a burning heat in the chest; such were the symptoms we experienced, and which brought on a syncope of six minutes duration. *M. Nysten* has concluded from a multitude of experiments made by injecting this gas into the veins; 1st. That it dissolves with the greatest promptitude in the venous blood of the animals into which it is injected. 2nd. That when injected in the quantity of from thirty to forty decimetre cubes, it does not at first give rise to any observable primitive effect; but if the injections are multiplied, especially if the dose be augmented, it finishes by producing on the nervous system phenomena similar to those it produces when respired in great quantity, and those pheno-

mena may be followed by death, which begins then by the brain. 3rd. That notwithstanding the solubility of the acidulous gas of Azote, if a very large quantity of it be injected at once, for instance, 200 or 300 centimetre cubes, it instantly produces the distention of the pulmonary portion of the heart, and death, which in that case begins by the heart. 4th. That, injected in considerable quantity, but not sufficient to produce fatal nervous phenomena, and with the necessary precautions to prevent distention of the heart taking place, it is capable of occasioning staggering, but that this effect quickly ceases, and is not followed by any serious consecutive accident. 5th. That it does not occasion any apparent change in the arterial blood. (Op. citat. p. 77.)

SYMPTOMS PRODUCED BY THE NARCOTIC POISONS.

891. The symptoms produced by this class are nearly the same, whether the poisonous substance be introduced into the cellular texture or into the stomach, or injected into the veins; characters which distinguish them from the major part of those which we have been speaking of in the three preceding classes.

892. These symptoms may be reduced to the following; stupor, numbness, heaviness of the head, inclination to sleep, at first slight, afterwards insurmountable; vertigoes, a sort of intoxication, furious or lively delirium, sometimes *pain;* convulsive movements slight or strong in all parts of the body; paralysis of the posterior extremities, dilatation of the pupils, diminished sensibility of the organs of sense, state resembling apoplexy, pulse frequent or rare, full and strong, particularly in the first period of the malady; respiration in the natural state, sometimes however a little accelerated; nauseas, vomitings, especially when the poison has been applied to the cellular texture, or injected in a glyster; the nervous symptoms

grow more severe, and the animals die. Death takes place very suddenly when the poison has been injected into the veins; it is less so, when it has been applied to the cellular texture: lastly, it happens still more slowly when it has been introduced into the stomach.

LESIONS OF TEXTURE, PRODUCED BY THE NARCOTIC POISONS.

1st. No alteration can be discovered on dissection in the digestive canal of persons, who have swallowed one of the poisonous substances of this class; and if facts contrary to this assertion be met with in authors, it is because there have been administered irritating substances capable of producing inflammation.

2nd. When applied to the cellular texture, or to the cutis, they produce a slight irritation similar to what any other extraneous body would do.

3rd. The lungs frequently exhibit lesions similar to those we have described in giving the history of acrid substances, (p. 99), and it is remarkable enough, that a number of those animals which are affected with this lesion do not experience, when alive, any morbid phenomenon which could give rise to a suspicion of it: respiration is neither accelerated nor difficult. This fact, it appears to us, ought to be placed beside another, which is sometimes observed in the human species, viz; *that there are cases of chronic, or even of acute pneumonia, without either cough or expectoration, or fever; the patients do not even complain of breathing with any great degree of difficulty.**

* The diagnosis in these diseases can only be established with certainty, by the concurrence of the two following signs; 1st. The impossibility of making deep respirations. 2nd. The pain of the breast: single, these signs would be of small avail; combined, they are sufficient for deciding on the existence of this affection. How often have we seen our friend and master

4th. The blood contained in the ventricles of the heart, and in the veins, is frequently coagulated a short time after death: an assertion diametrically opposite to that advanced by several professors of Medical Jurisprudence.

5th. The brain and its meninges frequently exhibit distensions of the veins, which creep over their surface, or are distributed throughout their texture. The lesions of the other organs appear to us inappreciable.

TREATMENT OF POISONING BY THE NARCOTICS.

893. The remedies hitherto proposed as antidotes for the Narcotic poisons, are, 1st, vinegar and the vegetable acids; 2nd, the infusion or decoction of coffee; 3rd, a solution of Chlorine in water (fluid oxygenated muriatic acid); 4th, Camphor; 5th, water and emollient drinks; 6th, bleeding. We shall here relate the experiments we have made for ascertaining the efficacy of these means, principally in cases of poisoning by Opium. We shall afterwards speak of the steps necessary to be taken by the medical attendant in cases of this nature.

1st. *Of Vinegar and the Vegetable Acids.*

894. *Ought we, in the present state of medical knowledge,* to persist obstinately in admitting a fact, not supported by rigorous experiments, merely because some illustrious men have advanced it, and it has been generally adopted? Whatever be the respect due to the illustrious characters who are constantly and successfully occupied in bringing to perfection human knowledge, we are of opinion that it is of importance not to embrace their opinions, when they are the declaration

Dr. Recamier, whose medical knowledge is so extensive, recognise by these means affections of the lungs, which had escaped the sagacity of other practitioners?

of incorrect facts, and tend rather to retard than accelerate the progress of medical science. Wherefore we shall not hesitate to oppose a doctrine, professed still in our days by the greatest masters of the art, to wit; *that vinegar and vegetable acids are antidotes to Opium.* In fact, vinegar and the other vegetable acids can only be the antidotes to Opium, in as much as that they decompose it rapidly in the stomach, and convert it into a substance, the effects of which will not be hurtful to the animal economy; now we are able to affirm from a very great number of facts collected with care, *that these acids aggravate the symptoms of poisoning by Opium, whenever they are not vomited.* The following are the proofs of this proposition.

Experiment 1st. A young cat was made to take three drachms of vinegar containing Opium in solution, and mixed with six drachms of water. Ten minutes after, the animal was asleep. At the end of ten more it was insensible, and lying down upon the side: its muscles exhibited continual convulsive motions, and so violent, that every part of the animal was in extreme agitation; these shocks continued three hours afterwards, but the animal possessed a slight degree of sensibility. It died five hours and a half after the ingestion of the fluid, the muscles were rigid and contracted; the heart contained a tolerable quantity of coagulated blood.

Experiment 2nd. Two drachms of crude Opium bruised, were mixed with an ounce and half of distilled vinegar: forty-eight hours after, this acid had dissolved a tolerable large portion of the poison: it was of a red colour. Two ounces of water were added, and the mixture was introduced into the stomach of a great strong dog; the œsophagus was tied. The animal died five hours after; he exhibited the following symptoms: drowsiness, paralysis of the posterior extremities, trembling of the head, and convulsive shocks. He was opened the next day. The mucous membrane of the stomach was easily

detached, but not inflamed ; the lungs were livid and distended with blood.

Experiment 3rd. Wishing to know whether the deleterious effects observed in the preceding experiment depended on the portion of Opium dissolved in the vinegar, or on the undissolved sediment, another robust animal was made to take the acetic fluid, obtained by putting two drachms of crude Opium in contact, forty-eight hours, with an ounce and a half of vinegar: this fluid was filtered and diluted with two ounces of water. Five and twenty minutes after, the animal was under the influence of the poison, and died at the end of five hours. The digestive canal exhibited no trace of inflammation.

Experiment 4th. At nine in the morning, two drachms of the watery extract of Opium were introduced into the stomach of a small robust dog, having been perfectly mixed with two onnces of distilled vinegar, and three ounces of water: the œsophagus was tied. Ten minutes after, the animal made efforts to vomit. At half past nine he became sleepy. At fifty minutes after nine, the posterior limbs were extremely weak, and the animal could not walk without bending them exceedingly. The ligature of the œsophagus was untied, and two ounces of vinegar, mixed with four ounces of water, were again introduced into the stomach. At a quarter past ten, he was no longer able to lift the hind feet, walked with great difficulty, dragging them after him, and had some convulsive movements. At eleven o'clock, these movements became very violent, and took place by shocks similar to those seen in frogs exposed to the action of the Voltaic pile ; his limbs were stiff, stretched out ; and he was in a state of great dejection. He was once more made to take an ounce of vinegar mixed with two ounces of water. He made horrible contortions, beat himself about, and expired a quarter of an hour afterwards. The mucous membrane of the stomach was slightly inflamed.

Experiment 5th. At noon, the œsophagus of a large and strong dog was detached and perforated: two drachms of crude Opium, as much divided as possible, contained in a paper cone, were then introduced into the stomach. Twenty minutes after, he was made to take three ounces of vinegar mixed with an equal quantity of water, and the œsophagus was tied. At two o'clock the animal did not appear to be at all under the influence of the poison. The ligature was detached, and eight ounces of vinegar, with four of water, were again introduced into the stomach. At five o'clock, he was lying down on the belly, and was not capable of keeping himself a moment on his feet; his body, which was agitated by violent convulsive movements, was tossed about in all directions; his extremities, stiff and separated asunder, were beating together almost continually. These symptoms continued till eight o'clock, and the animal died. He was opened the next day. The stomach contained a very great quantity of vinegar and a little Opium; its mucous membrane, which was of a blackish red, was easily detached, and ulcerated in several points: the subjacent coat, which was of a dark colour, was scattered over with blackish streaks: the lungs were gorged with blood in a fluid state.

895. If the effects produced by Opium and its extract administered alone, be compared with those produced by them associated with vinegar, we shall be obliged to conclude, 1st. That, in the first case, the phenomena of poisoning are longer in making their appearance. 2nd. That they are in general much less violent. 3rd. That death constantly takes place at a later period. 4th. That they are scarcely ever followed by inflammation of the stomach, whilst vinegar instantly produces it, when it is a little concentrated.

896. It is then evident that the use of this acid would be followed by the most serious symptoms, if the animals to which it is administered should not vomit the poison which has been

introduced into the stomach. It happens differently when the poisonous substance has been expelled by vomiting: in that case, the vinegar and water, and other vegetable acids, possess the property of *diminishing the symptoms of poisoning*, and *even to put an end to them altogether*. The following are the experiments on which this important proposition is founded.

Experiment 1st. At eight in the morning, thirty-three grains of the watery extract of Opium, dissolved in a drachm and half of water, were applied to the cellular texture of the thigh of a dog of middle size. At half past eight, the animal was asleep, and labouring under violent convulsions; his posterior extremities were almost completely paralyzed. Six ounces of vinegar and water were introduced into the stomach, by the assistance of a tube of elastic gum and a syringe; five minutes after, the convulsions were not at all diminished. At eleven he was nearly in the same state, four ounces of vinegar and water were again injected into the stomach; at half past twelve the animal appeared better, and began to be able to support himself on his posterior extremities; five ounces of vinegar and water were given to him: at half past two he had no more convulsive movements, and was able to stand on his legs; four ounces more of vinegar and water were administered to him: at a quarter before five, the animal was sensibly better; *(four ounces of vinegar and water):* at seven in the evening, he was walking about freely; he was made to take a fresh dose of the same fluid; at half past ten he experienced no giddiness, and appeared almost recovered *(four ounces of vinegar and water).* The next morning, at seven o'clock, he was lying down upon the side, and had a slight propensity to sleep; six ounces of vinegar and water were given to him, and the effects of the Opium completely ceased: the following day he took food, and was in extraordinary good health ten days afterwards. It was ascertained, by repeated experiments, that

twenty grains of the same extract placed within the cellular texture, constantly produced the death of animals of the same size, in six, twelve, fifteen, or eighteen hours.

Experiment 2nd. At half past seven in the morning, eight ounces of vinegar and water were introduced into the stomach of a small dog; the œsophagus was tied. Immediately after, thirty grains of the watery extract of Opium, dissolved in two drachms of water, were injected into the cellular texture of the thigh. At five minutes before eight, the posterior extremities were a little feeble; the animal was drowsy and uttered slight complaints. At nine the ligature of the œsophagus was untied, and four ounces of vinegar and water were injected into the stomach. At eleven, the symptoms of poisoning were not more violent. *(Two ounces of vinegar and water.)* At one, the weakness of the extremities continued; the animal was not able to remain long at a time on his legs; nevertheless he could walk. At ten minutes after two, he walked with greater ease. *(Two ounces of vinegar and water.)* At six he was sensibly better, he was made to take a fresh dose of the medicine; but as the attentions to him were discontinued, he died at four in the morning.

897. It is certain that in this experiment, the vinegar and water prevented the symptoms of poisoning, from being carried to the degree they would have been if it had not been administered; there is likewise no doubt that they would in the end have disappeared altogether, if the animal had not been so feeble, and more especially if this medicine had been continued to him during the night. We could relate a very great number of similar facts, which prove that when vinegar and water is employed at several different doses, within the first four and twenty hours of the poisoning, the symptoms decrease in violence, however severe they may have been at first. We shall prove hereafter, that the good effects of this drink do not depend on the water which it contains.

Experiment 3rd. At five minutes before eight, six ounces

of water, acidulated with *tartaric* acid, were introduced into the stomach of a small robust dog; the œsophagus was tied: immediately after, thirty grains of the watery extract of Opium were injected into the cellular texture of the thigh. At a quarter past eight, the posterior extremities were somewhat feeble. At nine the animal was asleep; the weakness of the posterior limbs was increased: the ligature of the œsophagus was detached, and four ounces of the tartaric water were injected into the stomach. At eleven, in the same state *(four ounces of the same medicine)*: at two, the animal was already able to walk; the drowsiness was less, a fresh dose of the same medicine was given; at six in the evening he continued better *(four ounces of the tartaric water)*: the attentions to him were discontinued, and he died at four in the morning.

Experiment 4th. Another animal was submitted to the same experiment, with this difference, that the dose of extract injected into the cellular texture, was forty-eight grains, and the œsophagus was not detached. The animal died twenty-two hours after the operation: he was made to take at nine different times the tartaric water, and a diminution was observed in the symptoms: he died in the morning because the medicine had been neglected to be administered to him during the night. It is certain that, without the use of the acidulated water, he would have died four or five hours after the injection.

Experiment 5th. At eight in the morning forty grains of the watery extract of Opium, dissolved in two drachms of water, were injected into the cellular texture of the thigh of a small strong dog. At nine the dog was under the influence of the poison; six ounces of common lemonade were introduced into the stomach: the œsophagus was tied. At half past eleven, the animal was labouring under tolerably strong convulsive movements; the posterior limbs were paralyzed (*three ounces of lemonade*): at two, he was in a deep sleep. He was made to take four more ounces of lemonade, and another

dose was given him at six: at half past eight, the sleep was less profound, the animal was able to support himself upon his posterior extremities (*four ounces of lemonade*). This medicine was discontinued during the night, and he died at four in the morning.

2nd. *Of the Infusion and Decoction of Coffee.*

Experiment 1st. At nine in the morning, two drachms of the watery extract of Opium, dissolved in three ounces of a strong infusion of coffee, at the temperature of 40°, were introduced into the stomach of a small robust dog; the œsophagus was tied.* At eleven the animal was scarcely under the influence of the poison; his posterior extremities began to grow weak. The ligature of the œsophagus was untied, and three ounces more of the same infusion were injected into the stomach. At one the pupils were dilated, the animal still walked about freely, and had no tendency to drowsiness. He was made to take eight ounces of the same medicine: immediately after, he made some efforts to vomit, which depended probably on the great quantity of fluid contained in the stomach. At three, he was extremely agitated; his eyes started from the orbits, the body was stiff, and the posterior limbs completely paralyzed; from time to time the animal attempted to rise; he moved himself in every direction, dragging the hind feet after him; then stopped all at once, grasped the ground with his fore feet, reflected his head upon the back, and appeared to suffer considerably. From the beginning of the experiment, he had preserved the faculty of seeing and hearing; six ounces of the same infusion were administered to him: the symptoms continued, and he expired at twenty minutes after four.

* The infusion, which we have employed in all our experiments, has been prepared by pouring from eighteen to twenty ounces of boiling water upon seven or eight ounces of excellent coffee, reduced to a fine powder.

Experiment 2nd. At seven in the morning, thirty-four grains of the watery extract of Opium, dissolved in a drachm of water, were injected into the cellular texture of the thigh of a dog of middle size. At a quarter before eight, the posterior extremities were completely paralyzed, the animal had a great tendency to sleep, and exhibited from time to time violent convulsive shocks: he was made to take four ounces of a strong infusion of coffee at the temperature of 40°. At nine, the symptoms continued, a fresh dose of this medicine was administered to him, and was continued every two hours till ten at night. At noon, the symptoms began already to diminish; at four the animal had no longer any convulsive movements, and was walking about at his ease. At seven in the evening he appeared very much awake, and was running about the laboratory as if he had not met with the least accident: he was the same the next morning. During the day he was neglected; the symptoms returned afresh, and he died towards eight in the evening.

Experiment 3rd. At half past eight in the morning, the same experiment was repeated upon a small dog, upon whom only twenty grains of the watery extract of Opium were injected. Three quarters of an hour after, the animal presented all the symptoms of poisoning; he was made to take four ounces of the infusion of coffee: at half past ten, he experienced no relief, a fresh dose of the same medicine was given to him; at noon, the symptoms appeared somewhat diminished *(four ounces of infusion of coffee)*: at three, the posterior extremities extremely feeble, and the head presented a very remarkable trembling. At five, there were no more convulsive movements *(four ounces of the infusion of coffee)*. At eight, the animal was able to stand, and walked about with tolerable ease; the trembling of the head had entirely disappeared: the attentions to him were discontinued, and he died in the night.

Experiment 4th. At nine in the morning, forty grains of

the watery extract of Opium were injected into the cellular texture of a small strong dog. At a quarter past, the posterior extremities were feeble: four ounces of infusion of coffee were introduced in the stomach. At ten, the animal was nearly in the same state; he was made to take a fresh dose of the same medicine. At half past eleven, he exhibited violent convulsive shocks, and kept himself lying down on the side. At three, the symptoms of poisoning were diminished *(three ounces of infusion of coffee)*. At a quarter past six, the convulsive movements had disappeared, the animal was walking about at his ease; the posterior extremities were however somewhat weak. There is no doubt that if the same means had been continued, the health of this animal might have been restored. No assistance was given to him during the night, and he died the next morning at seven o'clock.

Decoction of Coffee.

Experiment 1st. At ten in the morning, two drachms of crude Opium bruised and mixed with ten ounces of a strong decoction of coffee, were introduced into the stomach of a large dog: the œsophagus was tied. At four, the posterior extremities were feeble, and the animal had only a very slight tendency to sleep: he died the next day at four in the morning. The vessels creeping over the exterior surface of the brain were slightly injected; there was no serosity in the ventricles; the lungs presented several patches of a dense texture, and of a livid colour; the digestive canal was sound.

Experiment 2nd. At three in the afternoon, a robust dog of middle size was made to swallow three ounces of coffee, which had been made to boil for half an hour in twelve ounces of water; the œsophagus was detached, and two drachms of crude Opium bruised, mixed with the decoction resulting from three ounces of coffee, were introduced into the stomach: the œsophagus was then tied. Three hours afterwards the

symptoms of poisoning were evident, and the animal died the next day, at one in the afternoon.

Experiment 3rd. At two o'clock, a dog of middle size was made to swallow twenty-three grains of Opium, and a drachm of the watery extract of the same substance. Forty minutes after, the animal was asleep, and his posterior extremities grew feeble. Eight ounces of a strong decoction of coffee were injected into the stomach by means of a tube of elastic gum; some moments after, he passed a stool composed of solid matter: at half past four the symptoms of poisoning were not diminished; he was made to take twelve ounces more of the same decoction, and six ounces of the powder of coffee: the animal died in the night. The digestive canal presented no vestige of inflammation.

Experiment 4th. At a quarter before nine, twenty-four grains of the watery extract of Opium, dissolved in one drachm of water, were injected into the cellular texture of the thigh of a small dog. At half past nine, the animal presented all the signs of poisoning; he was made to take three ounces of a strong decoction of coffee. At a quarter before eleven, he complained greatly, and was so much agitated by convulsive movements, that it was impossible to inject a fresh dose of the medicine into the stomach. A glyster was administered to him, consisting of six ounces of decoction of coffee; the symptoms acquired a greater degree of violence, and the animal died at half past twelve.

898. It results from these experiments:

1st. That the infusion and decoction of coffee ought not to be considered as antidotes of Opium, because they do not possess the property of decomposing it in the stomach, or rather because they do not convert it into a substance destitute of any quality prejudicial to the animal economy.

2nd. That neither one or the other of these two preparations of coffee, when introduced with Opium into the stomach, increase the deleterious action of this poison, as takes place with

vinegar; and consequently that there is no danger of employing them in any case where the person would not be able to vomit, whilst there would be a great deal in employing vinegar under the same circumstances.

3rd. That the infusion of coffee well prepared, administered at several different times, diminishes rapidly the symptoms of poisoning by Opium, and may even put a stop to them altogether.

3rd. *Of Chlorine dissolved in Water (fluid Oxygenated Muriatic Acid).*

899. It has been announced in some work on the Materia Medica, that Chlorine diminishes the action of Opium on the animal economy. Supposing this fact true, we have thought that it might be explained by the facility with which this body seizes on the hydrogen of certain vegetable and animal substances, and decomposes them. It was possible that the result of such a decomposition was a matter incapable of exerting an injurious action on the animal economy: in this case, Chlorine would have been an *antidote to Opium*, and, for the same reason, it would have been so probably to a very great number of other poisonous substances belonging to the vegetable kingdom. These considerations have appeared to us sufficiently important to fix the whole of our attention, and we have tried the following experiments.

Experiment 1st. Two drachms of the watery extract of Opium, suspended in ten ounces of water containing Chlorine, were introduced into the stomach of a strong dog (this fluid Chlorine was not sufficiently concentrated to discolour ink); the œsophagus was tied. At the end of three quarters of an hour, the animal was under the influence of the poison, and expired five minutes afterwards. The digestive canal exhibited no vestige of inflammation; which proves that the solution of Chlorine was extremely weak, since we have seen, (page 94 of this volume) that it inflames the texture of the stomach when moderately concentrated.

Experiment 2nd. At nine in the morning, two dogs were made to swallow two drachms of crude Opium, enclosed in two paper cones; and the œsophagus of each was tied. At one o'clock their posterior extremities were paralyzed. The ligature of the œsophagus was untied, and four ounces of Chlorine dissolved in water, were introduced into the stomach. At two, the symptoms, far from diminishing, were become more violent (the same dose of Chlorine). At five in the evening, two fresh doses of this medicine had already been administered; the animals died in the night. The mucous membrane of the stomach was strongly inflamed.

Experiment 3rd. At half past nine, a mixture of two drachms of the watery extract of Opium, and four ounces of a watery solution of Chlorine, moderately concentrated, were introduced into the stomach of a strong dog: the œsophagus was then tied. The animal soon made some efforts to vomit, and experienced all the symptoms of poisoning by Opium; and died at the expiration of six hours. The mucous membrane of the stomach was of a bright red throughout its whole extent; the subjacent muscular coat was of a rose-colour; the interior of the rectum presented an inflammation sufficiently distinct; the lungs exhibited here and there some livid patches.

These experiments, repeated on a number of animals, have constantly given the same results. It is evident that at the degree of concentration, at which Chlorine might be capable of decomposing Opium in the stomach, it ought to be considered itself as an acrid poison, and that consequently it cannot be employed as an *antidote* to this poisonous substance. The first experiment proves likewise that, when it is very much diluted and mixed with the Opium in the stomach, it does not prevent the symptoms from taking place. We wished to discover what would be the effects of the solution of Chlorine on the disease produced by Opium, when this poison is not in the stomach.

Experiment 4th. At a quarter before nine, thirty-six grains of the watery extract of Opium, dissolved in one drachm of water, were injected into the cellular texture of the thigh of a small robust dog. Six minutes after nine, the animal exhibited all the symptoms of poisoning by Opium. Four ounces of water containing a small quantity of Chlorine, were administered to him. At half past ten, his situation did not appear to be changed. He was made to take another dose of the same medicine: at a quarter past one he had passed several stools, and was somewhat better *(four ounces of water containing Chlorine).* At three o'clock the animal was quiet, the posterior extremities were less feeble *(fresh dose of the medicine).* At five he was capable of standing; at seven he walked about freely *(four ounces of water, slightly impregnated with Chlorine).* No assistance was given to him during the night. The next morning at seven o'clock, he staggered a little, and appeared dejected: he was made to take four ounces more of the same medicine; but died five hours afterwards. This experiment, twice repeated, furnished the same results; whence it follows, that a weak solution of Chlorine is capable of diminishing the effects produced by Opium, and might probably put an end to them altogether if its administration were not interrupted; however, as this medicine does not present any decided advantages over vinegar, and since its preparation is somewhat complicated, we ought to give the preference to this vegetable acid, which daily necessities render extremely common.

4th. *Of Camphor.*

900. Camphor has been extolled by some as the antidote of Opium. We wished to ascertain how far this assertion was well founded.

Experiment 1st. Two drachms of Opium, and as much Camphor bruised, were introduced into the stomach of a small robust dog. Twelve hours after, the animal was under

the influence of the Opium, his extremities were slightly paralyzed. He died thirty-six hours after the ingestion of the mixture. The digestive canal exhaled a strong smell of Camphor; the mucous membrane of the stomach was of the natural colour; but it presented near the pylorus *two ulcers*, each one as large as a shilling, with elevated edges, and blackish.*

Experiment 2nd. A mixture made with two drachms of the watery extract of Opium, and as much Camphor dissolved in two ounces of olive oil, was introduced into the stomach of a robust dog of middle size: the œsophagus was then tied. At the end of half an hour, the animal experienced a horrible convulsive fit produced by the Camphor, and expired a quarter of an hour after.

In other experiments, the doses of these two substances were varied, and it was observed that death constantly took place when they were administered in a sufficiently strong dose, and that the phenomena which preceded it depended at one time upon the Camphor, at another time on the Opium, according as one or the other of these poisons happened to be in excess.

901. These facts are sufficient for us to affirm that Camphor does not decompose Opium, and hinder it from acting as a poison, and consequently that it is not its *antidote*. We shall see however, at the end of this article, that the physician may employ with success small doses of this medicine, in order to combat the symptoms produced by a large quantity of Opium.

5th. *Of Water and Mucilaginous Drinks.*

902. We have established that water acidulated with the vegetable acids might be extremely useful in cases of poisoning by the narcotics, and especially by Opium. Might it not

* We shall see hereafter that this alteration is owing to the fragments of Camphor.

be imagined that the good effects of this drink depend on the great quantity of water which enters into its composition?—the desire of throwing a light on this subject has engaged us to make some experiments, the results of which ought so much the more to excite our curiosity, as *M. Porta*, an Italian physician, has lately announced positively in one of the last numbers of the Journal of *M. Leroux, that by means of cold water administered in drink and in glyster, and applied in fomentation to the abdomen*, he obtained the cure of a lady who had been poisoned by mistake with the decoction of three ounces of Opium.

Experiment 1st. At eight o'clock, a drachm and half of the watery extract of Opium, dissolved in eight ounces of water at the ordinary temperature, were introduced into the stomach of a dog of middle size: the œsophagus was tied. At half past eight the animal began to be under the influence of the poison *(six ounces of water)*. At nine, the symptoms of poisoning were much more violent: the same quantity of water was administered to him. He died at ten. It is certain that the same quantity of extract dissolved in one or two ounces of water, would not have produced death until the expiration of ten, twelve, or eighteen hours. (Vide page 111 and seq.)

Experiment 2nd. At three quarters past seven, eight ounces of water, at the ordinary temperature, were injected by the assistance of a tube of elastic gum into the stomach of a small weak dog. Immediately after, thirty grains of the watery extract of Opium, dissolved in a drachm and half of water, were injected into the cellular texture of the inside of the thigh. The animal vomited at the end of five minutes; immediately six ounces of water of the ordinary temperature, were injected into the stomach. At nine, the symptoms were alarming: a fresh injection was made of the same fluid. He expired at half past nine.

Experiment 3rd. The next day, at the same hour, the ex-

periment was begun on a robust dog of middle size, with the same dose of the watery extract of Opium. At half past twelve, thirty ounces of water, which had been divided into five parts, had been introduced into the stomach; the animal was not less under the influence of the poison. The symptoms, far from diminishing, had acquired greater violence, and he expired at three o'clock, amidst the most violent convulsions.

Experiment 4th. For the ordinary water, water ad zero in a fluid state was substituted, and was administered in drink and in glyster: the animal died after the second dose, an hour and quarter after the external application of thirty-three grains of the watery extract of Opium. This animal was small and robust.

Experiment 5th. The same results were obtained by applying the mucilaginous decoction, instead of common water.

These experiments prove evidently:

1st. That the good effects of acidulated drinks do not depend on the water which they contain.

2nd. That this fluid ingested into the stomach with Opium, facilitates its absorption, by dissolving it, and consequently that the making patients poisoned by this substance swallow a quantity of it should by all means be avoided.*

6th. *Of Bleeding.*

903. Bleeding has been extolled by some celebrated phy-

* The property which water has of dissolving rapidly the watery extract of Opium contained in the stomach, furnishes us with an answer to an observation which might be made to us; viz; *if the experiments tried by introducing the vinegar of commerce into the stomach of dogs that have taken the extract of Opium, hastens death, does the same thing take place when vinegar simply diluted with water is administered, and the poison has not been expelled by vomiting?*—We are of opinion, in consequence of a very great number of facts, that it is still dangerous to employ vinegar and water; because this acidulated drink dissolves better the Opium, than water would do alone, and consequently that the absorption is more energetic.

sicians, for curing the disease produced by Opium. *Tissot* says: " if it should happen that by imprudence, by mistake, by ignorance, or by evil design, that too great a quantity of Opium, or of any other preparation into which it enters, shall have been taken; such as theriaca, mithridate, diascordium, liquid laudanum, &c. the patient must be immediately *bled*, and treated in every respect as if he had a sanguineous apoplexy, made to respire a great quantity of vinegar, and to drink plenty of vinegar and water." (Avis au *peuple*, tom. ii. §. 535, p. 280, 7^e^ edit.) Several practitioners have remarked that Opium acts with less energy when administered to persons who have lost a great quantity of blood. These considerations engaged us to make the following experiments.

Experiment 1st. At three quarters past eight, thirty-three grains of the watery extract of Opium, dissolved in a drachm and half of water, were applied to the cellular texture of the inside of the thigh of a robust dog of middle size. Half an hour after, the animal was under the influence of the poison: one of the veins of the posterior extremities was opened, and three ounces of blood taken away. At half past ten, the animal was sensibly better: he was bled again. A quarter of an hour after, he walked about freely in the laboratory. At one, he was again bled. The next day he appeared recovered.

Experiment 2nd. At three quarters past eight, the experiment was commenced again on a strong dog. At a quarter past nine, he was sleepy, and the posterior extremities appeared completely paralyzed: a vein of one of the posterior extremities was opened, and two ounces of blood drawn. Twenty minutes after, convulsive movements. At ten, a fresh bleeding; but it was impossible to obtain more than one ounce of blood. At half past eleven, the animal was in a dangerous situation; it was attempted in vain to bleed him, and he expired at one o'clock.

Experiment 3rd. Bleeding at the anterior and posterior

extremities, was practised upon four other animals poisoned by the same dose of the watery extract of Opium, which had been applied to the cellular texture of the inside of the thigh. Two of them died nearly in the same manner as if they had not been bled. The two others were alive two days after, and presented scarcely any symptom of poisoning. They died the third day, because they were neglected.

Experiment 4th. At seven in the morning, the right jugular vein of a small robust dog was opened, and fourteen ounces of blood were drawn. Immediately after, thirty-three grains of the watery extract of Opium, dissolved in two drachms of water, were applied to the cellular texture of the posterior extremity. At a quarter past eight, the animal was under the influence of the poison; but the symptoms were not so severe as in another animal much stronger, which had not been bled, and to which the same dose of the extract had been applied at ten minutes before eight. At nine, convulsive shocks, which might be compared to the movements impressed on frogs, by the electric fluid disengaged from the pile of Volta. This animal was nevertheless capable of supporting himself for some time on his feet, whilst the other had the posterior extremities completely paralyzed. At half past nine, three ounces more blood were drawn from the jugular vein. At eleven, lying down on the side, impossibility of standing, continual trembling, *(another bleeding of two ounces):* immediately after, respiration slow, and laborious; the other symptoms acquired a greater violence, and he died at half past twelve. It is evident that this animal lived at least as long as if he had not been bled.

Experiment 5th. At seven in the morning, thirty grains of the watery extract of Opium, dissolved in two drachms of water, were applied to the cellular texture of the inside of the posterior extremity of a small strong dog: half an hour after, the animal was under the influence of the poison; four ounces of blood were drawn from the jugular vein. At six in the

evening, the bleeding had been repeated five times. At nine, he was very well. The next morning, two basons of broth were given him, and he was perfectly recovered.

Experiment 6th. At eight o'clock, the same experiment was begun on a dog of middle size, half an hour after, he was under the influence of the poison: four ounces of blood were drawn from the jugular vein. At a quarter before nine, convulsive movements. At half past ten, the symptoms appeared somewhat diminished *(another bleeding of three ounces)*. At twelve, decidedly better: at two in the same condition. The animal ceased to be taken care of, and died at five o'clock. In two other instances, the dogs submitted to this experiment, died about the same period at which they would have died, had they not been bled.*

904. It results from these considerations.

1st. That bleeding has never aggravated the symptoms of poisoning by Opium, nor accelerated the moment of death.

2nd. That it has appeared useful in some instances, and even has sufficed to restore the animals, which would have died if it had not been put in practice.

3rd. That it appears to us, that it ought to be performed on plethoric and robust persons, who may be under the influence of Opium.

4th. Lastly, that it is more advisable to open the jugular vein, than any other.

905. The detailed examination, which we have just given of the value of each of the means proposed, for combating the poisoning in question; permits us to trace out the steps which the physician called in to a case of this kind ought to pursue.

* These experiments were repeated under my eyes by Dr. Rousseau, my friend and pupil, who made them the subject of an inaugural dissertation sustained by him before the faculty of medicine at Paris, in the month of August, 1815.

1st. *He will favour the expulsion of the Opium, by vomiting,* by making the patient swallow strong emetics, such as are capable of exciting the contractility of the stomach: these are, the antimoniated tartrate of potash in the dose of five or six grains; the sulphate of zinc in the *dose of from fifteen to eighteen grains;* or the sulphate of copper, in the dose of three or four grains; this last salt administered in a stronger dose, might be capable of occasioning death by producing the inflammation of some portions of the digestive canal, as we have already observed in several experiments made on this subject. Should these means prove insufficient to provoke vomiting, and there was a certainty of the person having taken a strong dose of Opium, might not one or two grains of tartarized antimony, dissolved in one or two ounces of water, be injected into the veins?—These means would probably induce vomiting, and the expulsion of the Opium, which, without that, would have been absorbed, and have proved fatal.

2nd. *The dissolving these emetics in a large quantity of water must be avoided, or filling the stomach with fluid, whether mucilaginous, acid, or even watery, with the design of expelling the Opium.* In fact, these fluids do not always produce vomiting, and they possess the great inconvenience of dissolving the poison, and facilitating its absorption.

3rd. *A bleeding should be instituted from the jugular vein immediately after the expulsion of the poisonous substance, which should be repeated according to the temperament of the patient.*

4th. *Then there should be administered alternately water, acidulated with vinegar, lemon juice, tartaric acid, and a strong infusion of hot coffee;* these drinks should be given in a small dose, which should be frequently repeated, for instance, every ten minutes. We are convinced that it would be dangerous to administer the acidulated drinks before the expulsion of the poison.

5th. Glysters of camphor may be employed every twelve hours. Care should be taken to warm frequently the patient's bed, and to rub his arms and legs roughly.

6th. If the patient should have taken the Opium some time, and there be a suspicion that it might be found in the large intestines, recourse should be had to purgative glysters.

906. The precepts which we have just established, differ from those found in Bulliard, and in some other works treating on the mode of curing poisoning by Opium; however, we are certain that the means which we propose are salutary: we have often employed them in animals poisoned by a dose of Opium so strong, that they would have died at the end of two or three hours; and have succeeded in curing them. It is true, our experiments have been made upon dogs, and it may be objected to us, that the results might be different in the human species. This objection appears to us to be ill founded, for Opium is absorbed, and produces the same effect on men as on dogs. The means then proper for combating them, cannot be different. Beside, we are convinced, that the difference which may exist between these two species of animals with regard to the mode of action which poisonous substances exert, has been singularly exaggerated. We dare to affirm, after having made more than two thousand experiments upon dogs, and compared them with what is observed in the human species, *that this difference is null with regard to the nature of the symptoms which poisons produce, and to the manner in which they ought to be combated; that it exists only in the doses necessary for carrying the disease to the same degree, in the influence of the moral powers, and in the relative strength of the animals,—circumstances which can produce an influence only on the violence of the symptoms, and on the duration of the disease.*

907. Poisoning by henbane, nightshade, and the other narcotic poisons of this class, except the prussic acid, ought to be combated as we have just described, when speaking of Opium.

908. *Prussic Acid.* *M. Coullon,* who has made some researches respecting the remedies proposed for curing the poisoning by this acid, has ascertained: 1st. That the oil of olives does not oppose the effects produced by prussic acid; 2nd. That the same may be said with respect to milk; 3rd. That ammonia affords a feeble relief to this kind of poisoning; 4th. The same thing happens with respect to theriaca; 5th. Lastly, that Chlorine (oxygenated muriatic acid) is a feeble remedy.

The professor *Emmert,* whose medical knowledge is so extensive, has made numerous researches respecting the antidotes of the prussic acid, and has been desirous of communicating to us the result of his labours, which he has not yet published. "I have not yet been able to discover," says he, "any antidote for the prussic acid. The caustic potash does not oppose in any manner its effects, nor those of the water of the laurel, or of bitter almonds; phenomena so much the more extraordinary, as these two last fluids lose their poisonous properties when they are treated by the muriate of iron and potash; now, there is iron in the caustic potash. *Fontana* had already observed, that the *Lapis infernalis* (potash with lime), combined with the oil of laurel, did not prevent this latter from acting, whether it was administered internally, or applied externally. Amongst all the medicines I have employed, the *oil of turpentine* appears to be that which acts the most powerfully in combating the effects of these poisons. The same considerations may be applied to the *oil and to the bark* of the *prunus padus,* the action of which on the animal economy is the same as that of the prussic acid."

909. It results from these facts that the physician, who is called in to a case of poisoning of this kind, should hasten to administer a strong emetic; after which he should employ the oil of turpentine, and all the stimulants capable of exciting sensibility and contractility.

CHAPTER V.

Class 5th. OF THE NARCOTICO-ACRID POISONS.

910. The name of *Narcotico-Acrid* poisons has been given to such as are endued with an acrid and nauseous taste, and which act at the same time as narcotics and rubefacients. We will shew hereafter how little the denomination of *Narcotico-Acrid* is applicable to the major part of the poisoning substances of this class; for, 1st, their narcotic effects are almost always the result of the strong excitement they produce at first; 2ndly, some of them do not produce any rubefaction on the texture to which they are applied.

OF THE BELLADONNA.

911. The *Belladonna* is a plant of the family of the *Solana,* arranged by Linnæus in the Pentandria Monogynia.

Calyx monophyllaus, bell-shaped, permanent, half-divided into five pointed segments: corolla campanulated, twice as long as the calyx, monopetalous, of a dirty red or ferruginous colour, with a border bellying out, and divided into five lobes almost unequal; five stamina, the filaments of which are filiform: one style somewhat inclined, terminated by a headed stigma one germen superior, egg-shaped, which, when ripe, appears in the form of a berry almost round, surrounded at its base by the calyx, of a black colour, and divided internally into two

cells, each one containing several oval or kidney-shaped seeds, attached to a fleshy placenta, or simply embedded in the pulp; the placentas adhere to the divisions of the cells by means of a small membrane: the embryo of the seeds is nearly circular, situate near the middle of the perisperm: flowers axillary, borne on short peduncles: stalk, from six to nine decimetres in height, hairy, and very branchy: leaves oval, very entire, frequently double, and of unequal size. This plant grows in large ditches, and on the edges of hilly woods.

ACTION OF BELLADONNA ON THE ANIMAL ECONOMY.

Experiment 1st. Thirty ripe berries of Belladonna were administered to a small dog: the animal experienced nothing.

Experiment 2nd. At eight in the morning, half an ounce of the watery extract of *Belladonna*, prepared by evaporating in a water-bath the fresh juice of the plant, and dissolved in an ounce and half of water, was introduced into the stomach of a robust dog of middle size: the œsophagus was tied. At half past eight, efforts to vomit, remarkable agitation. At five minutes after nine, fresh efforts to vomit, plaintive cries, posterior extremities beginning to grow weak. At half past ten, continual acute cries, posterior extremities still weaker. These symptoms increased in violence, and the animal died at a quarter before twelve. He was opened the next day. The inferior lobe of the right lung was dense, of a livid colour, and but little crepitating; the other lobes presented the rosy hue which is natural to them; the heart contained coagulated blood; the mucous membrane of the stomach was of a red colour throughout its whole extent, but it was not very much inflamed.

Experiment 3rd. Twenty grains of the watery extract of *Belladonna*, dissolved in two ounces of water, were introduced into the stomach of a young cat. A short time after,

the animal threw up by vomiting, about the third part of the fluid ingested. At the expiration of thirty-five minutes, it staggered in walking. A quarter of an hour after, it was not able to make a single step without falling; the pupils were dilated; the animal lay down upon its side, and when made to walk, appeared completely intoxicated; but it preserved its sensibility. Five hours after the ingestion of the poison, it was perfectly recovered. *(Experiment communicated by M. Brodie.)*

Experiment 4th. At half past one, a robust dog was made to swallow four drachms of the same extract, dissolved in five drachms of distilled water, and prepared by an apothecary: the œsophagus was then tied. At three, the animal had not presented any remarkable symptom. At six, he uttered acute and almost continual cries, was very restless, his motions were slow; but he had no vertigo. The next morning, at ten o'clock, his pupils were excessively dilated, he continued to moan, and remained quiet, unless when forced to walk: he then made a few steps without wavering; the head appeared heavy, and was inclined on the breast. At six in the evening, he was drowsy, staggered much in walking, and resembled a person drunk with wine; he uttered plaintive cries. He died at nine the same evening. The mucous membrane of the stomach was scarcely red, but it presented about the centre, four small ulcers; the intestinal canal was sound; there were, on the edge of the inferior lobes of the lungs, several blackish spots; the ventricles of the brain contained no serosity; the veins distributed over the external surface of this viscus were distended with blood; the pia mater was somewhat injected.

Experiment 5th. At eight in the morning, a wound was made in the inside of the thigh of a dog of middle size; two drachms of this extract, prepared by the same apothecary, were placed in contact with the cellular texture: the lips of the wound were united by suture. At the end of twelve

minutes, the pupils were already very much dilated; the animal appeared somewhat agitated, and turned round perpetually, describing a small circle tolerably regular; the pulsations of the heart were extremely frequent. At nine, his head was heavy, there was a tendency to sleep; the hind feet appeared somewhat weaker; the other symptoms continued; at two, he was much in the same state. At eight in the evening, he appeared to ail nothing. The next morning, he was found dead. The wound was tolerably inflamed, without any slough; the limb operated on was very considerably infiltrated; the digestive canal sound; the stomach contained some half-digested aliments (the animal had not vomited); the ventricles of the heart contained a little blood, partly fluid, partly coagulated; the lungs, which were of a deep red colour, presented here and there blackish spots; their substance was a little distended with blood of a black colour; it was nevertheless sufficiently crepitating.

Experiment 6th. The same experiment was begun again at six in the evening, and two drachms of the same extract, slightly moistened, were employed: the animal died in the night. The following day, at five in the morning, a small strong dog was submitted to the same experiment, and two drachms of the same extract were employed, dissolved in a drachm of distilled water. Twenty minutes after, the animal appeared to suffer; he ran backwards and forward uttering continual complaints: the pulsations of the heart were regular, strong, and frequent; his pupils were dilated. At half past six, he continued to complain, and to be agitated; his head appeared heavy. At nine, he was extremely ill; his posterior extremities grew weak; he could with difficulty support himself; he wavered in walking; his cries were more acute; the dilatation of the pupils was extreme; respiration difficult, and somewhat accelerated; the pulsations of the heart as before; the senses were less susceptible of impressions. He died at eleven. At twelve, he was opened. The feet

were stretched out and stiff; the heart contained in its cavities some clots of blackish blood (the animal was still tolerably warm); the lungs appeared a little less crepitating than in their natural state; in the ventricles of the brain, there was only one atom of serosity; the vessels of this organ were only slightly injected; the digestive canal appeared sound; the infiltration of the limb operated on was very remarkable; and there was much coagulated and extravasated blood.

Experiment 7th. Thirty grains of the same watery extract, dissolved in six drachms of water, were injected into the jugular vein of a small dog. Three minutes after, the animal began to have a tendency to drowsiness. At the end of two minutes more he vomited some glairy matter, and experienced slight vertigoes; his posterior extremities were weak; the right pupil extremely dilated. He was perfectly recovered six hours after the injection.

Other dogs died on injecting into the jugular vein forty or five and forty grains of the watery extract of *Belladonna*.

Experiment 8th. We have repeated the preceding experiments, with the same quantity of the extract of *Belladonna*, bought of other apothecaries, and have obtained effects not very decided, which, without doubt, depends on the manner in which the extracts have been prepared.

Observations.

1st. A child, four years of age, of a weak constitution, but in other respects in good health, ate, on the twenty-seventh of October, at eleven o'clock, a tolerably large quantity of the berries of *Belladonna*. He was seized immediately after with loathings, retchings, vomitings, drunkenness, a slight delirium, and an inextinguishable thirst. The physician, who was called in, judged that it was a case of poisoning. It was five in the evening when he saw the child for the first time, and already tumefaction and redness of the face and lips were discernible, with distention of the eyelids, dilatation of the

pupil, insensibility of the eyes, convulsive state of the jaw, of the muscles of the face, and of the extremities; delirium, &c. &c.; the pulse was extremely weak, the breathing irregular. The physician ordered half a drachm of ipecacuanha and of sugar in powder, mixed and divided into eleven doses. One of these was given every half hour. Vomitings took place, which brought up in several portions four berries of *Belladonna*, and a great quantity of the gastric juice coloured by the juice of the plant. At eleven at night, *Dr. Munniks* was called in, with his father, and Professor *Fellingue*. The patient had taken, beside the ipecacuanha, a drink composed with honey, water, and vinegar: he was extremely drowsy, although agitated by convulsive movements; livid spots were perceived over the surface of the body; the sweats were profuse. The child vomited again in their presence, and brought up a berry of the *Belladonna:* they caused the legs and feet to be covered with cataplasms, composed of rye-flour and vinegar; and a mixture composed of water, vinegar, simple oxymel, and dulcified spirit of nitre, was prescribed, to be taken by the half ounce every hour. On the 28th of October increase of the convulsive movements, redness of the face, and sweats; the pupil remained dilated, and there was beside a rigidity in the spine of the back, tumefaction of the abdomen, which was extremely sensible to the touch; constipation, small pulse. A purgative draught was prescribed, with tamarinds, senna, and simple oxymel. In the evening an oily glyster was given; the constipation ceased, and all the symptoms appeared diminished. The 29th, in the morning, he continued better; the mixture with the vinegar and water was continued: in the afternoon the delirium returned, with tumefaction of the abdomen and constipation; *Aphthæ* likewise made their appearance: the purgative draught was repeated. In the evening there was fever, agitation with drowsiness; the patient complained besides of pains in the teeth: the draught with vinegar and oxymel was repeated. Such a degree

of quiet was established, that on the 13th the constipation had ceased, the appetite was returned, and in fine the patient entered upon his convalescence. From the 31st of October to the 4th of December, a perfect cure was obtained by the continuance of the same means.*

2nd. Some children ate in a garden the fruit of the *Belladonna*. Shortly after they had a burning fever, with convulsions, and very strong palpitations of the heart; they lost their senses, and became completely delirious; one of them, four years of age, died the next day: the stomach contained some berries of the Belladonna crushed, and some seeds; it exhibited three ulcers; the heart was livid, and the pericardium without serosity.†

3rd. The following are the symptoms experienced by above a hundred and fifty soldiers, who were poisoned by the berries of the Belladonna, which they gathered at Pirna, near Dresden.

"Dilatation and immobility of the pupil; insensibility, almost complete, of the eye to the presence of external objects; or at least confused vision: injection of the conjunctiva by a bluish blood; protrusion of the eye, which in some appeared as if it were dull, and in others ardent and furious; dryness of the lips, tongue, palate, and throat; deglutition difficult, or even impossible: nauseas not followed by vomiting; sensation of weakness, lipothymia, syncope; difficulty, or impossibility of standing; frequent bending forward of the trunk; continual motion of the hands and fingers; gay delirium, with a vacant smile; aphonia, or confused sounds uttered with pain; probably ineffectual desires of going to stool; insensible restoration to health and reason, without any recollection of the preceding state. (*Journal de Sedillot*, Decembre, 1813, p. 364, observ. de *M. E. Gaultier de Claubry.*)

* *Journal General de Médecine*, liv. xxiv. p. 224.

† *Histoire de l'Academie des Sciences Annee*, 1706. Article *Botanique*.

4th. *Wepfer* relates an observation of a child, ten years old, who experienced symptoms similar to those which form the subject of the preceding observations, after having eaten some berries of the Belladonna. (Op. citat. p. 227.)

5th. One child ate four ripe berries of the *Belladonna*, another ate six. Both one and the other were guilty of extravagances which astonished the mother; their pupils were dilated; their countenances no longer remained the same; they had a cheerful delirium, accompanied with fever. The physician being called in found them in a state of great agitation, talking at random, running, jumping, laughing *sardonically;* their countenance purple, and pulse hurried. He administered to each of them half a grain of emetic tartar, and a drachm of Glauber salt, in four or five ounces of water: they had copious evacuations during seven or eight hours, and the symptoms disappeared.*

6th. *Mappi* says, that the wine of *Belladonna* gave rise to a universal gangrene, which was followed by death. (*Plant. Alsat.* p. 36.)

912. The facts above detailed permit us to conclude:—

1st. That the *Belladonna* and its extract possess poisonous properties, extremely energetic.

2nd. That they exert a local action not very violent; but that they are absorbed, carried into the circulation, and act upon the nervous system, and particularly on the brain.

3rd. That they produce symptoms common to some other poisons, which are insufficient to characterize that species of poisoning, notwithstanding what has been advanced on that subject by many authors.

4th. That the extracts of commerce vary singularly with respect to their energy, according to the manner in which they have been prepared; and that the most active are *those which*

* *Gazette de Santé*, 11 Thermidor, an. xv. p. 508.

have been obtained by evaporating with a very gentle heat, the juice of the fresh plant.

5th. That their action is much more violent, when injected into the veins, than when they have been applied upon the cellular texture; and by a still stronger reason, than in the case where they have been introduced into the stomach.

6th. That these preparations appear to act on the human species in the same manner as upon dogs.

OF THE *DATURA STRAMONIUM.*

913. The *Datura Stramonium* is a plant of the family of the *Solana*, arranged by Linnæus, in the pentandria monogynia.

Calyx large, tubular, bellied, with five angles and five divisions; permanent at its base; corolla very large, monopetalous, in shape of a funnel, of a white or violet colour, the tube insensibly dilating, longer than the calyx, having a border with five folds, and five acuminated teeth; five stamina; one style with a thick stigma, having two layers; superior germen rounded, and grooved with four furrows: the fruit is a capsule, having four valves, rounded, covered with curved points, straight and thick; quadrilocular inferiorly, bilocular superiorly, and containing a very great number of kidney-shaped seeds, the embryo of which is nearly circular, and placed in the midst of the perisperm. Stalk from nine to twelve decimetres in height, round, hollow, and extremely branchy: leaves petiolated, smooth, broad, angular, and pointed. This plant is fond of fat and moist lands; it is found by the side of roads, and in cultivated places.

ACTION OF THE *DATURA STRAMONIUM* ON THE ANIMAL ECONOMY.

Experiment 1st. At half past nine in the morning, half an

ounce of the watery extract of *Datura Stramonium*, prepared by an apothecary, and dissolved in six drachms of distilled water, was introduced into the stomach of a robust dog of middle size: the œsophagus was tied. At the end of six minutes, the animal made some efforts to vomit, and was extremely agitated; he ran about the laboratory, and endeavoured to make his escape, uttering plaintive cries. An hour after, he had already tried twelve or fifteen times to vomit; his posterior extremities were a little weak, but he still preserved the power of walking about freely; his breathing was accelerated at intervals; the pulsations of the heart were strong and frequent, and he continued to moan. At three quarters past ten, he was a little drowsy; the weakness of his legs increased, and he preserved the use of his senses. At eleven, the posterior extremities bent, and he fell down on his side, but he shortly after rose again; he already staggered a little in walking. At half past four, continuation of the complaint, vertigoes very decided. He died in the night.

Dissection. The stomach contained about six ounces of a bloody fluid; the mucous membrane, which was of a bright red throughout its whole extent, presented on the folds which it forms near the pylorus, a very great number of black bands, which were longitudinal, about a line in breadth, and which were only blood extravasated between this membrane and the subjacent coat; this latter was of a cherry red in the places corresponding with these bands: the rectum, which was without alteration, was lined with a black stringy matter; the lungs were of a deep red in several places, and distended with black and fluid blood; the ventricles of the brain contained no fluid; the external veins of this organ were injected and distended.

Experiment 2nd. At eight in the morning, an incision was made in the inside of the thigh of a small strong dog; two drachms of the watery extract of Datura Stramonium, almost solid, were brought in contact with the cellular texture, and the

lips were united by a few stitches. At five in the evening, the animal had not presented any remarkable phenomena. The next morning he was found dead. The wound was not much inflamed; the lungs presented some spots of a livid red colour, distended with black fluid blood; the ventricles of the heart contained also some fluid and black blood; the digestive canal was sound; the body was stiff, contracted, and extremely cold.

Experiment 3rd. The same experiment was repeated at six in the evening, and two drachms of extract slightly moistened were employed: the animal died in the night. The following day, at five in the morning, a small dog, tolerably robust, was submitted to the same experiment. The two drachms of extract were recently prepared and diluted with a drachm and half of distilled water. Half an hour after the operation, the animal uttered plaintive cries, he was agitated, and ran several times over the laboratory; his pupils were dilated. At half past six he was in the same state; the pulsations of the heart were strong, frequent, and tolerably regular; he preserved the free use of his senses, and of his motive faculty. At nine, he still was uttering acute cries, his posterior extremities were extremely weak, so also his walk was slow and uncertain; his head, which was heavy, was inclined, and almost touched the ground; the dilatation of the pupils was carried to as great a degree as possible, nevertheless he saw and heard well: the pulsations of the heart continued to be strong and frequent. A quarter of an hour after, the vertigoes were increased and the cries continued; the animal had passed no evacuations. He died at three quarters past eleven. He was opened ten minutes after twelve. The limbs were flexible; the heart contained a very great number of blackish clots (the body was nevertheless extremely hot); the lungs presented no sensible point of alteration; the case was the same with the digestive canal; the ventricles of the brain were empty, and there was no fulness in the vessels of this organ; the limb operated on was somewhat inflamed.

Experiment 4th. Fifteen grains of the same extract, dissolved in four drachms of water, were injected into the jugular vein of a very strong dog. At the end of two hours, the animal uttered some cries, and vomited twice some bilious matter. He made his escape in the night, and was seen alive two days afterwards, on the roofs of the houses adjoining to the laboratory.

Experiment 5th. The same experiment was repeated upon a small robust dog, with thirty grains of extract. At the same moment the animal stretched out his feet, and uttered plaintive cries; his head was reflected upon the back, and he fell down insensible. He died at the end of four minutes. The opening of the body took place immediately; the ventricles of the heart were no longer contracting; the auricles exhibited some extremely distinct pulsations; the blood contained in these organs was fluid; that contained in the aortic cavity was of a vermillion red; the lungs were only slightly shrivelled.

Observations.

1st. *Swaine* relates, that the decoction prepared with three capsules of Stramonium and milk, produced paralysis of the whole body, and the patient became mad; he remained in that state during seven hours; then he came to himself, and slept quietly during the night. (Swaine, *Essays and Observat. Physiol. and Litter.* vol. ii. p. 247.)

2nd. A man having drunk some decoction of the fruit, became melancholy; lost his voice; his pulse disappeared; his limbs were paralyzed; after which he went into a fit of madness. Another having drunk some milk boiled with the same fruit, experienced vertigoes, became insensible, talked at random; had a pulse, at first small and quick, afterwards scarcely sensible; his legs were paralyzed; and at last, he became mad. (Vicat, op. citat. p. 240.)

3rd. In collecting together all that has been written on the effects of this plant, upon the human species, by *Haller*,

Krause, Storck, Sprægel, Plehwe, and *Triller;* it may be said that it has produced intoxication, delirium, loss of sense, drowsiness, a sort of madness and fury; loss of memory, sometimes transitory, sometimes permanent; convulsions, paralysis of the limbs, cold sweats, and excessive thirsts and tremblings. *Haller* opened the body of a woman, who had taken the seed of this plant, believing it to be that of Gith. The cortical substance of the brain was full of blood; and there were some hard clots in the cavities of the cranium.

The *Datura Metela, Tatula,* and *Ferox,* are also poisonous. *Gmelin* says, that beer poisoned by the seeds of the *Datura Ferox,* has given rise to a delirium, which lasted four and twenty hours.

914. The conclusions to be drawn from these experiments are entirely analogous to those which we have given at the end of the article on the *Belladonna,* a plant which equally belongs to the family of the *Solana;* the *Datura* appears however to excite more strongly the brain, and to produce a more violent general action.

OF TOBACCO.

915. Tobacco (Nicotiana Tabacum) is a plant of the family of the *Solana,* arranged by *Linnæus* in the Pentandria Monogynia.

Characters. Calyx of one single piece, in shape of a cup, cut into five segments, acute, and slightly hairy; corolla monopetalous, in shape of a funnel, of a purplish rose colour, or ferruginous, with a tube twice the length of the calyx, with a plain border, opening like a cup, and having five divisions, equal, short, and pointed: five stamina close to the stigma before fecundation, forming a kind of crown; but which recedes when this organ has been fecundated: capsule egg-shaped, conical, grooved with four streaks, with two cells opening at the top in four parts, and containing a great num-

ber of very fine seeds; the embryo of the seeds is curved, and placed in the axis of the perisperm: flowers in a panicle, at the extremity of the branches; stalk, from four to five feet high, cylindrical, strong, thick as the thumb, slightly hairy, and full of marrow: leaves large, oval, lanceolated, sessile, and even prolonged upon the stalk, on each side of their insertions; their summit is acute, edges slightly undulated, surface hairy, with ribs very apparent; their colour, a little yellowish, or of a pale green. The root is fibrous, branchy, white, and of a strong acrid taste.

ACTION OF TOBACCO ON THE ANIMAL ECONOMY.

Experiment 1st. At eight in the morning, five drachms and a half of rappee snuff, were introduced into the stomach of a robust dog of middle size, and the œsophagus was tied. A few minutes after, the animal made some efforts to vomit. At a quarter past two, he walked very slow, experienced slight vertigoes, and exhibited a continual trembling in the posterior extremities; the organs of sense appeared to enjoy all their faculties; the breathing was a little accelerated. At ten minutes after four, he was lying on the side, and could no longer support himself on his feet; however, he made from time to time ineffectual efforts to raise himself; his head was heavy, and exhibited a continual trembling; his countenance bore the marks of stupor; the muscles of the cervical vertebræ were agitated with slight convulsive movements; the limbs were flaccid; the organs of sense appeared less susceptible of impression than in the natural state. The breathing was excessively deep, impeded, and accelerated; the pulsations of the heart were frequent and somewhat strong. He died at five o'clock; the next day he was opened. The lungs were livid throughout their whole extent; their texture was more dense than in the natural state, and they sunk a little in water; the

heart contained a few clots of black blood; the stomac contained a great part of the snuff ingested; it presented only a few reddish points; the rest of the digestive canal was sound; the body was flaccid.

Experiment 2nd. At two o'clock, an ounce of rappee snuff was introduced into the stomach of a dog of middle size, and the œsophagus was tied. A few minutes after, the animal made efforts to vomit; at four, he experienced no remarkable symptom: he died in the night. The mucous membrane of the stomach was of a bright red throughout its whole extent; the other portions of the digestive canal appeared sound. The lungs were livid, distended with blood, much more dense than in their natural state, and presented a great number of black spots. The greater part of the snuff was found in the stomach.

Experiment 3rd. At a quarter past eight, two drachms of rappee snuff and two drachms of water, were applied to the cellular texture of the inside of the thigh of a dog of middle size. Ten minutes after, the animal vomited. At half past eight, he made fruitless efforts to vomit, and began to experience some very slight vertigoes; his posterior extremities exhibited a tolerably decided trembling; his countenance appeared astonished. At a quarter before nine, the trembling was become general; the posterior limbs were somewhat weak; his walk very vacillating. Five minutes after, the animal was lying down on the belly;* his posterior extremities were elevated; the anterior bent; and he endeavoured, by making movements in every direction, to right himself, striking his head against the ground; he continued to tremble. A few moments after, he lay down on the side in a state of great relaxation. At twenty minutes after nine, his limbs were agitated at intervals with convulsions tolerably strong; the organs of sense were as susceptible of impressions as before the ex-

* The position of the animal appears to have been evidently upon the back, to answer the description given.—TRANSLATOR.

periment; his breathing was not impeded. He died at forty minutes after nine.

Experiment 4th. At two o'clock, sixteen grains of rappee snuff, and two drachms of water, were applied to the cellular texture of the inside of the thigh of a robust dog. Ten minutes after, the animal vomited twice. At six, he began to experience slight vertigoes, and a trembling in the posterior extremities; he died in the night. The lungs were of a deep red colour, and exhibited here and there livid spots; their texture was somewhat more dense than in their natural state: there was no alteration in the digestive canal; the limb operated on was very little inflamed.

Experiment 5th. Being desirous of knowing whether the active part of the rappee snuff resides in the portion which is soluble in water, or in that which is insoluble, the preceding experiment was begun again with four drachms of this powder, which had been treated eight different times, by a great quantity of boiling water, in order to exhaust it completely. Before uniting the lips of the wound by suture, four drachms of water were introduced. Forty-eight hours after, the animal had not experienced any remarkable symptom; he died at the end of the third day: nothing had been given him to eat, and he was feeble.

Experiment 6th. An ounce of the dried leaves of tobacco were boiled for an hour with six ounces of water; the fluid was filtered, and reduced to three ounces and a half by evaporation; it was introduced into the stomach of a robust dog of middle size, and his œsophagus was tied. Three minutes after, the animal made efforts to vomit, which he repeated several times during the first hour; he expired three hours after the ingestion of the fluid into the stomach, and experienced the symptoms related in the third experiment. He was opened the next day. The stomach was slightly inflamed; the intestinal canal did not appear altered; the lungs presented a very great number of patches of a livid colour, and very

broad ; their texture was more dense than in their natural state, and distended with blood.

Experiment 7th. The infusion of tobacco, prepared with five ounces of water, and half an ounce of the dried leaves, did not produce any accident in a robust dog of middle size.

Experiment 8th. *M. Brodie* injected into the rectum of several dogs, and one cat, from one to four ounces of a strong infusion of tobacco : these animals became insensible, motionless, and all died in less than ten minutes ; the pulsations of the heart were no more sensible a minute before death ; one of them only vomited. Their bodies were opened immediately after death ; the heart was very much distended, and no longer contracted ; in one case only after having cut into the pericardium, the auricles and ventricles, irritated by the instrument, began to contract with some force, and the circulation was capable of being prolonged for half an hour, by means of the sufflation of air into the lungs.

Experiment 9th. Eight ounces of decoction of tobacco were administered in the form of a glyster to a strong dog : this decoction had been prepared by boiling one ounce of smoking tobacco in nine ounces of water. Three minutes after, the animal rejected the fluid and vomited. During the first half hour, he did not cease to make violent and fruitless efforts to vomit ; in other respects, he suffered no inconvenience whatever ; the next day his health appeared restored. It is certain, this animal would have died, had he retained the glyster any longer.

Experiment 10th. *M. Brodie* applied upon the tongue of a young cat, one drop of the empyreumatic oil of Tobacco :* immediately all the muscles experienced violent convulsions, and the breathing was accelerated. Five minutes after, the animal became insensible, lay down on the side, and presented

* This oil had been obtained, by distilling the leaves of Tobacco, at the temperature of about 80°, R., and separating it from the water, on the top of which it was found after the distillation.

from time to time slight convulsive movements. A quarter of an hour after, it appeared recovered. The experiment was begun again, and the animal died at the end of two minutes: the thorax was instantly opened; the heart was contracting regularly and with force; the blood was of a dark colour. A tube was introduced into the trachea, for the purpose of conveying air into the lungs; the contractions of the heart were stronger and more frequent, and did not diminish at all during six minutes that the sufflation was continued; the tongue and brain presented no alteration.

Experiment 11th. One drop of the same oil, held in suspension by means of mucilage, in an ounce and half of water, was injected into the rectum of a dog. Two minutes after, the animal became weak, and made fruitless efforts to vomit. Twenty-five minutes after, he appeared recovered. The injection was repeated: he experienced instantly the symptoms related in experiment 10th, and died at the end of two minutes and a half. My friend *M. Macartney,* a learned professor of the school of Dublin, was so good as to communicate to me during his stay at Paris the following experiments, which he made some time since.

Experiment 12th. The upper part of the cranium, and a portion of the membranes, of the brain of a rabbit, were raised up: when the blood had ceased to flow, a few drops of the empyreumatic oil of tobacco were applied upon the surface of the encephalon. Half an hour after, the animal had not experienced any remarkable symptoms. It was then killed, by putting two drops of the same oil upon the tongue.

Experiment 13th. About half a scruple of this poison was introduced into the hemispheres of the brain of another rabbit, which had not produced any effect thirty minutes after. The animal was killed instantly, by the application of three drops of the same oil upon the tongue.

In other experiments, the animals experienced convulsions, and died in a short time, when the oil was introduced as far as

the *Pons Varolii;* but these accidents depended on a mechanical effect, for they took place equally when the instrument only was introduced, by means of which the empyreumatic oil had been first inserted.

Experiment 14th. The sciatic nerve of a rabbit was isolated from the surrounding parts, and touched several times with this poison; no accident resulted from it. In another experiment this nerve was isolated, transversely cut, and each of the extremities plunged into a small vessel of lead, containing a certain quantity of this empyreumatic oil. An hour after, the animal had not experienced any inconvenience, whilst he was instantly killed by the application of one or two drops on the tongue.

The same results were obtained by the essential oil of bitter almonds. Mr. Macartney made these experiments in support of a very great number of others which he proposes to publish, and which prove that the sensibility of the nerves resides in the extremities of the branches, and that the brain, which is the organ of perception, does not enjoy, in the habitual state of health, any sensibility.

Experiment 15th. At noon, a drachm of the watery extract of *Nicotiana Rustica* was applied to the cellular texture of the inside of the thigh of a small dog. Six minutes after, the animal uttered plaintive cries, and vomited some yellow matter. Twenty minutes after twelve, fresh vomiting, continuation of the complaints; at the end of two minutes, fruitless efforts to vomit. At one, the pulsations of the heart were accelerated as much as before the application of the poison. The next day, at three in the afternoon, he refused food; all his muscles were affected with a slight trembling; he was somewhat dejected. He died in the night. The mucous membrane of the stomach was of a colour nearly natural; but it presented near the pylorus, two black spots the size of a stout pin's head, the centre of which was ulcerated; the lungs exhibited

several livid spots containing, in their interior, some blackish blood.

Experiment 16th. The same experiment was repeated with a drachm and six grains of the same extract. At the end of fifteen minutes, the animal vomited several times, and made complaints. Thirty-six minutes after the application of the poisonous substance, he experienced very considerable vertigoes; he sunk into a state of general insensibility, and died eighteen hours after the operation. It was impossible to discover the least vestige of alteration in the digestive canal, lungs, or brain.

Observations.

1st. A woman applied to the heads of three children, who had the tinea, a liniment prepared with the powder of tobacco and butter: soon after they experienced vertigoes, violent vomitings, and faintings: they had profuse sweats. During twenty-four hours they walked as if they were drunk. (*Ephemer. des Cur. de la Nat.* Dec. 11, an. 4, p. 46.)

2nd. The decoctions of the leaves applied to parts affected with the itch, produced violent vomitings and convulsions. (Vandumond, *Recueil Periodique*, tom. vii. p. 67.) We read in the *Ephemerides des Curieux de la Nature*, that a person fell into a state of somnolency, and died apoplectic, in consequence of having taken by the nose too great a quantity of snuff.

3rd. The celebrated Santeuil experienced vomitings and horrible pains, amidst which he expired, in consequence of having drunk a glass of wine, into which had been put some Spanish snuff.

916. The facts we have just related induce us to believe:

1st. That the leaves of Tobacco, whether whole, or reduced to powder, as they are daily employed in commerce, are endued with energetic poisonous properties:

2nd. That their active part appears to reside in the portion which is soluble in water, and that it is absorbed, and carried into the circulation.

3rd. That their deleterious effects appear to depend on an especial action upon the nervous system ; and that they produce almost constantly, a general trembling, which is rarely observed when other poisons are employed.

4th. That their action is much more energetic when the soluble portion is injected into the anus, than when it is applied to the cellular texture, and for a still stronger reason, than when introduced into the stomach.

5th. That, independent of the phenomena which we have just been speaking of, they exert a local action capable of producing an inflammation more or less violent.

6th. That they appear to act on the human species as on dogs.

7th. That the *empyreumatic oil* does not act directly on the brain, nor on the body of the nerves, but that it directs its action to the nervous system in a manner which it is not at present easy to determine.

8th. That the extract of the *Nicotiana Rustica* acts in the same manner as Tobacco, but that it is less active.

M. Brodie had been tempted to admit that the infusion of Tobacco, when injected into the rectum, acted primarily on the heart: however, the following experiment caused him to renounce that opinion.

After having taken off the head of a dog, he kept up the respiration by sufflation, and introduced into the stomach and the intestines, nine ounces of infusion of Tobacco. At the moment of the injection the body of the animal remained motionless upon the table, and the heart was beating regularly one hundred times in a minute. Ten minutes after, the pulse gave one hundred and forty pulsations, the peristaltic motion of the intestines was increased, and the voluntary muscles of every part of the body presented very strong spasmodic move-

ments; the articulations of the extremities were alternately bent and extended; the muscles of the spine, of the abdomen, and of the tail, were at one time relaxed, at another time contracted, in such a manner, that the body turned first to one side, then to the other. The abdominal aorta was compressed during more than a minute, so that the circulation was stopped in the inferior limbs, which did not occasion any diminution in the muscular contractions. Half an hour after the injection of the infusion, the sufflation was discontinued; the heart continued to transmit blood of a dark colour, and the muscular contractions diminished in violence and frequency. A ligature was made on the vessels which are at the base of the heart, in order to suspend the circulation; nevertheless, the muscular contractions continued, although less strong, and less frequent than before; at length, after a few minutes, they ceased altogether.

If the contractions of the voluntary muscles, says *M. Brodie*, depended on the action of the blood mixed with the infusion of Tobacco, it is reasonable to suppose that they ought to have been diminished by the compression of the aorta, and that the ligature of it ought to have put a stop to them.

M. Brodie is of opinion, in consequence of this, that the infusion of Tobacco acts upon the heart by means of the nervous system.

OF PURPLE FOXGLOVE.

917. The purple Foxglove *(Digitalis Purpurea L.)* is a plant of the family of the *Personées* of *Tournefort*, and which Jussieu has classed amongst the *Scrophulariæ*.

Description. Calyx permanent, deeply cut into five segments, sometimes unequal; the leaflets arising from the calyx are oval, acute; corolla monopetalous, consisting of a tube swelling out, open, collected together at its base; border short, bearing four *divisions obtuse*, unequal; the superior

one frequently scolloped; the inside of the belly scattered over with red spots, like eyes, and with thin silky hairs; four stamina, two of which are short; style simple, or bifurcated; one capsule, egg-shaped, separated into two cells by a double partition, containing in each cell numerous seeds, small, angular, attached to a pyramidal placenta: stalk from two to three feet high, rising sometimes even to six; straight, or slightly inclined, commonly simple, hairy, furnished with purple flowers, which hang like bells on one side only, disposed in a long terminal spike, and to which succeed capsules egg-shaped, pointed, with rays, containing an infinity of small seeds; this stalk is grooved, cylindrical, and of a reddish green colour: leaves, alternate, petiolated, or drawn up at their base, oval, pointed, dentated like a saw, or rather festooned, wrinkled, of a deep green on the upper side, whitish and lanuginous below, very similar to those of petty mullein, but less woolly; root brownish, fusiform, throwing out here and there numerous branches.

The purple Foxglove is a biennial plant, which is found in the mountains, along hedges, in elevated woods, and in dry and sandy grounds: on which account the environs of Paris are abundantly furnished with it. *Bodard* says, that it appears to have a particular regard for the *Departement de la Mayenne.*

ANALYSIS OF PURPLE FOXGLOVE.

918. Six drachms of the powder of the leaves of purple Foxglove well dried, furnished to *M. Bidault de Villiers;* 1st. Two drachms, sixty grains, of watery extract; 2nd. Twelve grains of spirituous extract; 3rd. A peculiar precipitate, eight grains, and two drachms sixty grains, of an inert powder, which gave by the action of the re-agents, six grains of carbonate of lime, two grains of the oxyde of iron, three grains of sandy quartz, two grains of phosphate

of lime, one grain of sulphate of potash, traces of sulphate and muriate of lime and of carbonated alkali, one grain of charcoal.*

ACTION OF PURPLE FOXGLOVE ON THE ANIMAL ECONOMY.

919. The deleterious properties of Foxglove, and of most of its preparations, are placed beyond all doubt, by experiments made upon animals, and by numerous medical observations. We see in the dissertation of Schiemann, *(de Digitali Purpurea,* Gottingæ, 1786,) that dogs have died in consequence of having taken the extract or infusion of the leaves of Foxglove. Anxiety, melancholy, smallness and slowness of pulse, involuntary stools, and convulsions; such are the principal symptoms which these animals exhibited before death.

920. On what organ does the Foxglove exert its destructive action?

Experiment 1st. A strong dog was made to swallow a drachm and half of the powder of Foxglove. The next day, the animal had not experienced any remarkable phenomenon.

Experiment 2nd. At eleven o'clock, six drachms of the same powder were introduced into the stomach of a strong dog of middle size: the œsophagus was tied. At the end of two hours, the animal made efforts to vomit, his mouth was full of foam. At three, he experienced vertigoes, uttered plaintive cries, lay down upon the side, stretched out his paws, and reflected his head a little backward. At six, he was still able to walk, but staggered like a person drunk with wine; the pulsations of the heart were as before the operation. These symptoms increased in violence; the animal uttered complaints, and expired in the night. The stomach contained almost the whole of the powder ingested; the

* *Essai sur les Propriétés Médicinales de la Digitale Pourprée,* par le Docteur Bidault de Villiers, 3e edit. p. 61. *Paris,* 1812.

mucous membrane was scattered over throughout almost the whole of its extent, with spots of a bright red colour, evidently inflammatory; the rectum presented an alteration similar, but in a less degree.

Experiment 3rd. At one o'clock, an incision was made on the inside of the thigh of a small dog; the wound was sprinkled over with three drachms of the powder of Foxglove, and the lips were united by suture. At two, the animal had not experienced any thing. At four, he had vomited, and his mouth was full of foam. At half past nine in the evening, he experienced considerable vertigoes, and died an hour afterwards. The *dissection*, which took place the next day, did not exhibit any remarkable lesion.

Experiment 4th. At half past ten in the evening, two drachms of the watery extract of Foxglove were introduced into the stomach of a robust dog fasting, and the œsophagus was tied. The next day, at six in the morning, the animal appeared dejected; his walk was free; he experienced no vertigoes; the heart beat from one hundred and twenty, to one hundred and twenty-five pulsations in a minute; the pulsations were strong, equal, and by no means intermitting. At ten, the dejection was increased, the pulsations of the heart continued to be equally frequent. At one, slight vertigoes, difficulty of remaining a long time on his feet; evidently sinking; the state of the circulation the same. He was found dead two hours after. The opening of the body took place while the organs were still warm; the heart was no longer beating; it contained blood which was fluid, and of a deep red colour; the lungs were crepitating, and of a reddish colour; they contained a small quantity of blood; the stomach contained a tolerably large quantity of a brownish, viscous fluid; the mucous membrane was of a bright red throughout its whole extent, but principally near the duodenum; the interior of the rectum presented a few red spots.

Experiment 5th. At one o'clock, two drachms of the

watery extract of purple Foxglove, dissolved in three drachms of water, were introduced into the stomach of a robust dog; the œsophagus was tied. At the end of twenty minutes the animal made some efforts to vomit, and had some tolerably copious stools; the pulsations of the heart, far from being slower than before the ingestion of the poisonous substance, were somewhat more frequent, and by no means intermitting. At half past two, he had fresh stools, coloured brown by the extract. Sixteen minutes after, he had a fresh stool, which was liquid; violent efforts to vomit; pulsations of the heart regular, and as frequent as before. At three, fresh efforts to vomit; a liquid stool: the movements free. At eight, there was no change in the contractions of the heart; the walk of the animal was steady; he had several times a disposition to vomit. At two in the morning, he uttered some plaintive cries, and it is supposed soon after died.

Dissection. The stomach was distended by gas; it contained a small quantity of a greenish liquid matter; there was no lesion of the digestive canal; the lungs were almost in their natural state; the ventricles of the brain contained no serosity; the external vessels of this organ were not distended.

Experiment 6th. At eleven o'clock a wound was made in the back of a small dog, and a drachm of the same extract was brought in contact with the cellular texture; the lips were united by a few points of suture. Three quarters of an hour after, the animal vomited. At forty minutes after twelve, he did not appear to be ill; the pulsations of the heart were somewhat more accelerated than before the application of the poison; they were unequal and intermitting. At ten minutes after one, they were less strong, and almost imperceptible. A quarter of an hour after, the animal supported himself well upon all his four legs, walked about freely, and it would have been impossible to have foreseen the attack which followed immediately: all at once he experienced considerable vertigoes, uttered plaintive cries, walked with rapidity in a lateral

direction and from right to left: he fell down when he arrived near the wall of the laboratory, agitated his paws in a convulsive manner, reflected his head upon the back, and continued to complain in that state for the space of two minutes; a state of relaxation and insensibility then came on, which continued four minutes, after which the animal expired. Death was preceded by a general trembling of all the muscles.

Dissection. He was immediately opened. The heart was no longer beating; the blood contained in the ventricles was *fluid,* and of a somewhat deep red in the aortic cavity; the lungs, which were not very dense, were crepitating and of a rose colour: there was no alteration in the digestive canal.

Experiment 7th. The same experiment was repeated with two drachms of the watery extract of Foxglove, dissolved in two drachms of water; the animal had experienced nothing at the end of an hour and a quarter. He expired four hours after the operation, and presented the same symptoms as those which formed the subject of the preceding experiments. The dissection took place forty minutes after. The heart still preserved a considerable degree of heat, it was no longer beating, and contained a tolerably large quantity of *fluid* blood; there was no alteration in the digestive canal.

Several other animals of the same species were submitted to experiments of this kind, and we have constantly observed the symptoms and the phenomena on dissection, as we have reported in the two preceding experiments.

Experiment 8th. A drachm of the watery extract of purple Foxglove, dissolved in half an ounce of water, was injected into the jugular vein of a very strong dog. Two minutes after, the pulsations of the heart were diminished by ten strokes in the minute. At the end of two minutes more, the animal began to make violent efforts to vomit, and continued them during three minutes. Seven minutes after the injection, he looked astonished, preserved the free use of his senses, experienced slight vertigoes, walked about with his head hanging

down; the pulsations were more accelerated than before the operation. One minute after, he fell down upon the side, beginning first to sink behind; the head was reflected on the back; the extremities were agitated with some convulsive movements, and the organs of sense became insensible. To this state, which continued two minutes, succeeded a considerable diminution in the violence of the symptoms, and there remained only a general trembling of the muscles of the trunk. He expired at the end of three minutes. He was immediately opened. The heart contained only fluid blood, of a red vermillion colour in the left ventricle, and blackish in the right: the lungs were sound.

Experiment 9th. Half a drachm of the same extract, dissolved in half an ounce of water, was injected into the jugular vein of a small dog. The next day the animal had not experienced any thing remarkable; he refused, however, to receive food. Five days after the operation, he was walking about very well; had no vertigoes, but refused to take any food. He died in the night of the following day. There was no sensible lesion in the brain; the cerebral vessels contained hardly any blood; the lobes of the right lung, which were of a violet colour, and of a dense texture, as though hepatized, were distended with black blood; the left lung presented here and there some spots similar, as to their colour and their texture, to those which we have remarked on the right part of this organ; the stomach was lined with yellow bile; the membranes of the digestive canal presented no alteration.

Experiment 10th. At twenty minutes past two, two drachms of resinous extract, prepared by treating the powder of purple Foxglove with alcohol, were introduced into the stomach of a small dog, and the œsophagus was tied. At thirty-eight minutes after two, the animal experienced some nausea, and made some efforts to vomit; the pulsations of the heart, which were irregular and unequal, were more slow and more intermitting than before the operation. Six minutes after, he con-

tinued to make efforts to vomit; the heart beat only fifty-four strokes per minute, whilst before the ingestion of the poisonous substance, it was beating ninety. At twenty minutes after three, fresh efforts to vomit; no change in the pulsations of the heart. At five, the animal was walking about freely: there was no acceleration in the pulse; the desire to vomit still continued. It was reported to me that he died at half past seven the same day. The dissection, which took place the next day, discovered nothing in the lungs, nor in the digestive canal.

Experiment 11th. At forty minutes past ten, the same experiment was begun on a small robust dog, his heart beat from ninety to ninety-four pulsations in the minute. At half past one, the circulation was evidently deranged; the pulsations of the heart, which were as frequent as before the operation, were unequal, sometimes strong, sometimes weak, and they presented very distinct intermissions. At a quarter past two, the animal was lying down on his side, and preserved the use of his senses; however, he experienced slight vertigoes, and could not walk without staggering; his breathing was not interrupted; there was no change in the pulsations of the heart. At a quarter past three, he was placed upon his feet; he immediately bent the posterior limbs, bowed down the head almost to the ground; he shortly after righted himself; and tried to walk forward in a straight line. He had scarcely made two steps, when he bent the anterior extremities, and fell down upon his belly. These alternate movements of the hind feet, the fore feet, and the head, were renewed three times successively. At last, at seventeen minutes after three, the animal expired in a state of great insensibility and immobility. He was immediately opened. The limbs presented no stiffness; the pupils were excessively dilated; the heart was no longer beating; the blood contained in the left ventricle was of a bright red colour, and fluid; the right ventricle was nearly empty; the great vessels of the thorax, being wounded

in opening this cavity, allowed an effusion of blood to take place, and there was found, on the right of the dorsal vertebræ, a large *coagulum*, of a blackish colour and very hot; the lungs were crepitating, and contained a small quantity of blood.

Experiment 12th. A wound was made on the back of a small dog; two drachms of the resinous extract of Foxglove were brought in contact with the cellular texture; and the lips of the wound were united by suture. At the end of twenty minutes the animal vomited some alimentary matter, and several times during the five minutes which followed made efforts to vomit; there was no change in the pulsations of the heart. Forty-three minutes after the application of the poison, the pupils were excessively dilated, and he staggered a little in walking; he had a very copious liquid stool. Four minutes after, the vertigoes were so much increased that he bent his hind legs, fell down suddenly on the side, uttered a few slight cries, and appeared dead. In this state he passed a small quantity of urine; a general trembling appeared of the muscles of the abdomen, and *subsultus tendinum* of the right anterior extremity; the organs of sense no longer exercised their functions. He expired ten minutes after. The dissection took place immediately. The heart was no longer beating; the blood contained in the left ventricle was fluid and of a bright red colour; that of the right ventricle was all *coagulated* and black; the lungs, which were of a rose colour, appeared to be in their natural state; the digestive canal presented no alteration.

Experiment 13th. At half past two, the same experiment was repeated upon a dog of middle size. At twenty minutes past three, vomiting of alimentary matter; no relaxation in the circulation. Two minutes after, fresh vomitings, followed by fruitless and frequently repeated efforts. At half past three, a diminution of fifteen pulsations per minute, in the motion of the heart, inequality, distinct intermission. Ten

minutes after, acceleration in the circulation; pulsations of the heart more frequent than before the application of the poison; respiration somewhat impeded. Three quarters of an hour after, falling and other symptoms similar to those of the preceding experiment. Death took place at twenty-seven minutes after four.

The Dissection took place immediately: the heart no longer contracting; the blood contained in the right ventricle wholly coagulated.

Experiment 14th. At eleven o'clock, a drachm of the same extract was brought in contact with the cellular texture of the back of a small robust dog, and the lips of the wound were united by suture. At a quarter past twelve he vomited, and died at half past twelve, without our being able to observe him. He was opened ten minutes after. There was no longer any motion in the heart; the blood contained in the right ventricle was partly fluid, and presented some *coagula* tolerably large and blackish; that of the left ventricle was fluid, and of a red somewhat less bright than common; the lungs were rose-coloured, and but little crepitating.

Experiment 15th. Eighteen grains of resinous extract of Foxglove, suspended in half an ounce of water, were injected into the jugular vein of a small dog. The animal instantly experienced vertigoes; he made a few steps, fell down, rose again, and continued to walk staggering. One minute after the injection, the pulsations of the heart were somewhat relaxed; but a few moments after, they became as frequent as before the operation. At the end of five minutes, they preserved their frequency, and his walk was more vacillating. Two minutes after, the pulsations were no longer felt; the animal fell down upon his side; his head was reversed upon the back, and he experienced convulsive movements in the paws. This state continued four minutes, after which the animal uttered some plaintive cries; all his muscles were trembling, and he expired. He was opened the same mo-

ment. The heart was no longer beating, the blood of both ventricles was *fluid;* that contained in the aortic cavity was red; the lungs, which were crepitating, were wrinkled, and contained scarcely any blood; the tongue and gums were pale.

Experiment 16th. Ten grains of the same extract, suspended in three drachms and a half of water, were injected into the jugular vein of a small dog. Four minutes after, the animal vomited, passed a liquid stool, experienced vertigoes, which became stronger and stronger, to such a degree, that two minutes after he fell down on the side, uttered a few plaintive cries, separating his legs, and agitating them in a convulsive manner; his mouth discharged moisture, and his head was reflected on his back. He expired eight minutes after the injection. No change was observed in the pulsations of the heart. The body was immediately opened; the heart was no longer contracting; the blood was *fluid,* and of a deepish red colour in the left ventricle; the lungs presented no sensible alteration.

Experiment 17th. At half past eight, an ounce of tincture of purple Foxglove, prepared with brandy at 24°, and of the powder of this plant, were introduced into the stomach of a small dog: the œsophagus was then tied. At the end of five minutes, the animal was in a state of remarkable stupor; he had vertigoes, and could not make two steps without falling; the pulsations of the heart were by no means relaxed. At nine he remained lying upon the side; he complained from time to time; the stupor had increased; the pulsations of the heart were frequent, unequal, irregular; his inspirations were rare, but excessively deep; the eyes but little sensible to light, the pupils somewhat dilated; and he had no propensity to vomit. At half past one, convulsive tremblings of the muscles of the extremities; same state of stupor; impossibility of standing; complaints from time to time; pulsations of the heart frequent. At ten in the evening, in the same state. He died

the next morning at four o'clock. The mucous membrane of the stomach presented several patches of a deep red colour; near the pylorus were perceived some longitudinal bands of a blackish red, the colour of which depended on a certain quantity of blood extravasated between this membrane and the subjacent coat; this latter presented no alteration; the duodenum exhibited a lesion similar to that of the stomach; there was found near the end of the colon, in the space of four fingers' breadth, on its internal surface, a very intense redness, which extended itself to the subjacent muscular coat; the rest of the intestinal canal appeared very little altered.

Experiment 18th. Six ounces of brandy, at 24°, were poured upon ten drachms of the powder of purple Foxglove. After four days' digestion, the fluid was filtered and evaporated, adding water in proportion as the alcohol was reduced to vapour. At ten o'clock, four ounces of the fluid resulting from this process were introduced into the stomach of a small dog, being completely freed from all the spirit: the œsophagus was then tied. Twelve minutes after, the animal made efforts to vomit; his walk began to be vacillating; the pulsations of the heart were the same as before the operation; the eyelids heavy, like those of a person that is sleepy. At three, the stupefaction was carried a little farther. He died in the night. The mucous membrane of the stomach presented, in the two thirds of it next the pylorus, some small spots of a tolerably bright red colour, separated by intervals that were unaltered; the lungs and intestinal canal presented no sensible lesion.*

M. Brodie, during my stay in London, was so good as to communicate to me the following fact, which has the greatest connection with those which we have just been stating. He injected into the stomach of a small dog, half an ounce of the

* It is evident that the greatest part of the symptoms and lesions mentioned in the 17th experiment, were the consequence of the brandy in which the Foxglove was dissolved. (*Vide* article *Alcohol.*)

tincture of Foxglove, the alcohol of which had been previously evaporated, as has been pointed out in the preceding experiment. Half an hour after, seeing that this dose was without effect, he introduced two drachms more of the same liquor. At the end of ten minutes, the pulse was fallen from one hundred and fifty, to one hundred and twenty pulsations in the minute, and the animal experienced a trembling similar to that observed in a paroxysm of intermitting fever. This shivering lasted twenty minutes, after which the pulse again gave one hundred and fifty pulsations a minute. Shortly after, he vomited greatly, and passed several stools, which were repeated several times during the first two hours, which followed the ingestion of the poison. The next day, the animal was perfectly recovered.

Observations.

1st. *M. Bidault di Villers* says, " I chewed a large pinch of the powder of the leaves of Foxglove, which I had dried myself with care, and kept for some time. It had at first a nauseous and herbaceous taste ; afterwards I found it extremely bitter, and it caused me to render a tolerably large quantity of saliva, which secretion continued some time after I had spit out the powder, which I had triturated without any mixture in my mouth. It was not until the bitterness was totally dissipated, that I thought I perceived a slight sensation of acrimony in the throat. It caused me also a kind of inclination to vomit, or rather a weak heaving of the stomach, and dryness in the mouth. (Op. citat. p. 45.)

2nd. A feeble person labouring under anasarca and hydrothorax, swallowed by mistake four or five times as much Foxglove as was prescribed for him. He experienced nauseas, which increased so strong the next morning, that he threw up a little bile every five or ten minutes, after having made the most violent efforts to vomit. Dr. Beddoes, the reporter of this fact, being frightened, from having seen a very robust man

die in consequence of having taken the same infusion, administered three grains of opium, in two doses, at the interval of an hour one from the other; after which he ordered fifteen drops of thebaic tincture to be taken every hour in port wine, until he should sleep. The next morning, the vomitings were less frequent; they only returned once in half an hour, and sometimes an hour; the patient slept between each attack, and always awoke again with nausea. Sixty drops of tincture of opium were prescribed in a glyster, and twenty-four grains of powder of ipecacuanha, to be taken in three doses, in the form of pills; and lastly, extract of hemlock in the interval of the two hours between each dose. In the evening, another glyster was given. He perspired abundantly during the night, and woke still with nauseas; the vomitings, though less frequent, were sometimes accompanied with hiccup. The following day, he vomited no more bile, and appeared to be under the influence of the opium. The day after, he drank some toast and water without inconvenience, and experienced no uneasiness; the appetite returned, and he drank nearly half a bottle of wine in the day. Bark in substance was administered to him for eight days, combined with aromatics; the swelling of the feet, which had taken place for some days, especially towards night, had disappeared, and the patient was perfectly restored.*

3rd. *M. Sanders,* author of an excellent treatise on Foxglove, says, " In health every small dose of Foxglove increases the strength and frequency of the pulse, produces even inflammatory fever if it be increased, or if the use of it be continued. In a state of disease, the primitive effects are just the same, but there is observed beside, its influence on the affection, on the state contrary to nature; it vivifies, if I may so express it, ulcerated surfaces which are bleeding, or pale;

* Th. Beddoes, *Medical Facts and Observations,* vol. v.

facilitates the absorption of effused fluids, or prevents their effusion; fortifies the voluntary motions; gives activity to digestion; increases the evacuations by the skin and urinary organs; renders the pulse insensibly febrile; raises it from seventy to ninety pulsations in a short time, even from one hundred and twenty, to one hundred and thirty, or from one hundred and thirty, to one hundred and fifty, if the physician does not know when to stop; in fine, Foxglove gives to the moral principle the peculiar character which belongs to restoration of force. These are its good effects; but abuse and imprudence in the use of it, bring on derangement of the functions of the stomach, vertigoes, vomitings, want of sleep, violent pulsations of the vessels of the head, pains in different parts of the body, &c. Although the Foxglove be given up, the febrile symptoms continue nevertheless for four or five days with the same degree of intensity. In general however, at the end of four and twenty hours, and often sooner, the pulse falls from one hundred and twenty, to one hundred and ten, and one hundred irregular pulsations. As to their force and frequency, they are still more reduced; there exist low spirits, nausea, oppression of the præcordia, vomitings, which afford no relief to the patient, salivation, diarrhæa, abundant secretion of limpid urine, clammy moisture of the skin, even profuse sweats; countenance pale, expressive of despair. Two, three, or four hours more, and the violent symptoms diminish; the pulse far from rising immediately after the calm, sinks on the contrary to fifty, forty, thirty pulsations, and even lower. This increase of strength of the sanguineous system, and the consecutive diminution, vary according to the quantity of the medicine, the susceptibility of the person, the temperament more or less disposed to inflammatory fever; according as the patient is at the moment affected with a local inflammation, as sound or ulcerated parts are tending to a laudable suppuration: in that case the action of the Foxglove, and

that of the disease, are complicated; and possess greater violence.*

921. We may be permitted to conclude from the preceding facts:

1st. That the powder of Foxglove, its watery and resinous extracts, and its tincture, ought to be regarded as energetic poisons, in a certain dose.

2nd. That the resinous extract is endued with poisonous properties more active than the watery extract, and that the powder is less powerful than this latter.

3rd. That the action of the extracts is violent and rapid when injected into the jugular vein; that it is less so when applied to the cellular texture; and much less still when they are introduced into the stomach, and vomiting is prevented.

4th. That all these preparations begin by acting as emetics.

5th. That their effects on the organs of circulation vary according to the nature and dispositions of the individuals; sometimes no change can be observed in the manner in which this function is carried on; at other times the pulsations of the heart are relaxed; very frequently they are accelerated, strong, unequal, and intermitting.

6th. That the resinous extract appears to act especially on the heart or on the blood, since this fluid is constantly found coagulated immediately after death, whenever this extract has been applied to the cellular texture, or introduced into the stomach.

7th. That independently of these phenomena, Foxglove and its preparations act upon the brain after having been absorbed, and produce a sort of instantaneous stupefaction, which is quickly followed by death.

8th. That the powder of this vegetable occasions a local

* *An Inquiry concerning Digitalis, or Foxglove, Edinburgh*, 1808, p. 61 The facts contained in this little work are so much the more valuabl they have been collected from observations on the human species.

irritation capable of exciting an inflammation sufficiently intense.

9th. That all the observations conspire to prove that Foxglove acts upon the human species as upon dogs.*

OF MEADOW PIMPERNEL (*ANAGALLIS ARVENSIS*).

Experiment 1st. At eight in the morning, three drachms of the extract of Pimpernel, prepared by evaporating in a water-bath the juice of the fresh plant, and dissolving it in an ounce and a half of water, were introduced into the stomach of a robust dog of middle size. At half past twelve, the animal had a stool. At six in the evening, he was dejected. At eleven sensibility appeared diminished. The next morning at six, he was lying upon the side, and appeared to be dead; he might be displaced like an inert mass of matter. He expired half an hour after. The mucous membrane of the stomach was slightly inflamed; the interior of the rectum was of a bright red colour; the ventricles of the heart were distended by black coagulated blood; the lungs presented several livid spots, their texture was more dense than in their natural state.

Experiment 2nd. At eight in the morning, two drachms

* We foresee an objection which may be made to us by some practitioners; viz. *that Foxglove retards the motions of the heart in the human species.* We cannot admit this assertion in its full extent. In fact, 1st, we have taken every day, during a month, from four to twenty grains of this vegetable reduced to powder; we have never observed the smallest diminution in the pulsations of the heart; which circumstance agrees perfectly with an infinite number of observations reported by *M. Sanders.* 2nd. How many times has not the administration of this powder, or of its tincture, in hospitals been seen to increase fever, to produce a great heat in the chest, and spitting of blood. Wherefore we are of opinion, that this vegetable is very far from being entitled to be ranked amongst those which constantly diminish the motions of the heart, and this object appears to us of sufficient importance to fix anew the attention of practitioners.

of the same extract, mixed with an equal quantity of water, were applied to the cellular texture of the thigh of a small robust dog. The animal exhibited the same symptoms as that which forms the subject of the preceding experiment, and died at half past seven in the evening. The digestive canal was sound; the limb operated on presented a slight inflammation; the lungs and the heart were the same as in the preceding experiment.

M. Gronier gave to horses some tolerably strong doses of the decoction of this plant, and he observed almost constantly a trembling of the muscles of the posterior extremities, as well as those of the throat, and a copious flow of urine. After death, the mucous membrane of the stomach was found inflamed.*

OF COMMON BIRTHWORT (*ARISTOLOCHIA CLEMATITIS*).

922. This plant, ranked by Linnæus in the Gynandria Hexandria, belongs to the family of the *Aristolochiæ* of Jussieu.

Perigone (calyx) tubular, irregular, bellied at its base, enlarged at its orifice, and having its border prolonged and ligulated on one side: germen inferior, oval, oblong, angular, surmounted with a style very short, terminated by a concave stigma of six divisions, under which appear six anthera almost sessile, making one body with the pistil. The fruit is an oval capsule, of six angles, having six cells, opening by the base, and containing a great number of flat seeds: flowers of a pale yellow, pedunculated, and collected from three to five together in the axillæ of the leaves: stalk from four to six feet in height, tolerably strong, simple, covered with leaves, and angular: leaves alternate, petiolated, heart-shaped, smooth, pre-

* *Compte rendu des travaux de la Société de Médicine de Lyon*, ann. 1810, p. 17.

senting on their inferior surface a number of ribs ramified, and reticulated. This plant has an acrid and bitter taste: it grows on the banks of rivers, in clayey places, and among ruins.

ACTION OF COMMON BIRTHWORT UPON THE ANIMAL ECONOMY.

Experiment 1st. At seven in the morning, five drachms of fresh root of Birthwort powdered, were introduced into the stomach of a small robust dog; and the œsophagus was tied. The next evening, the animal had only experienced a slight dejection. The following day, at six in the morning, he had vertigoes, and could not walk without falling after making a few steps; he strained to vomit, and passed one solid stool; a quarter of an hour after, he was lying down on the side, but very little sensible to external impressions; his feet were stretched out, separated from one another, stiff, and were at intervals in a state of agitation. The head was reflected a little upon the back. At half past ten, the symptoms continued; the breathing was deep. He died at one o'clock. No alteration was discovered on dissection, except in the rectum, which presented some red spots.

Experiment 2nd. At eight in the morning, the same experiment was begun again on another dog about the same size; no particular phenomenon was observed in the course of the day. The next morning at seven, the animal presented from time to time, some slight convulsive movements in the ears; his posterior extremities were extremely weak; he had great difficulty in keeping himself for a moment on his feet; the head appeared heavy; the inspirations were deep. He died three hours after. The stomach contained a great part of the powder ingested; its coats were not altered; there were seen here and there in the large intestines, some livid spots; the lungs were of a beautiful rose colour; and were less crepitating than in their natural state.

Experiment 3rd. Seven ounces of the root of common Birthwort cut in pieces, were boiled with ten ounces of water. The fluid was reduced to seven ounces; it was then introduced into the stomach of a robust dog of small size, and the œsophagus was tied. An hour after, the animal made some efforts to vomit, which were frequently renewed during the four hours succeeding; he uttered plaintive cries, and fell into a state of dejection. The next morning at seven, (four and twenty hours after the operation,) the dejection was increased, the animal was lying down on his belly; nevertheless, he preserved the free use of his senses and motions: the following day, at eight in the morning, he was found dead. The dissection took place immediately. The body was still warm; the blood contained in the heart was brownish, and partly coagulated; the stomach and the rectum were somewhat inflamed; the other organs appeared sound.

The juice of the root of *Aristolochia Anguicida*, administered to serpents in the dose of a few drops, produces vertigoes, and causes them to die in convulsions. (MURRAY, *Apparatus Medicaminum*, tom. i. p. 516. Gottingæ, ann. 1793.)

923. It results from these facts:

1st. That the common Birthwort exerts a stupifying action on the nervous system.

2nd. That it produces a slight inflammation in the texture to which it is applied.

OF HEMLOCK (*CONIUM MACULATUM*, L. OR *CICUTA MAJOR* OF *LAMK*).

924. This plant belongs to the family of the *Umbelliferæ* of Jussieu, and to the Pentandria Digynia of Linnæus.

Characters. Flowers white, forming umbels very open and numerous: general involucrum, from three to five leaflets reflected, and membranous towards their base; *involucellum* of three leaflets disposed on the external side of the umbel,

and not extending beyond its rays. Each flower presents five petals heart-shaped, unequal, disposed in form of a rose, and inclining inwards : a small calyx, entire ; five stamina ; one inferior germen bearing two slender styles longer than the petals, and permanent; fruit oval, and globular; each side has projections, consisting of tubercular elevations, of which three are dorsal, and two lateral. Stalk cylindrical, from three to five feet in height, thick, hollow, branchy, covered with leaves, and in its inferior parts, with spots of a brown purple, or blackish : leaves large, somewhat soft, thrice-winged; the leaflets of which are lanceolated, dentated, pointed, somewhat shining, of a blackish green colour : root fusiform, a foot long, thick as the finger, yellowish without, whitish within, strong smell, and of a sweetish taste. This plant, when rubbed between the fingers, exhales a fetid smell; it is found on the sides of ditches, and in rather moist grounds.

ACTION OF HEMLOCK ON THE ANIMAL ECONOMY.

Experiment 1st. A small dog was made to swallow a drachm and half of the powder of Hemlock. Four hours after, the animal passed one stool. The next day he was in excellent health.

Experiment 2nd. Half an ounce of the same powder was introduced in the stomach of a small dog, and the œsophagus was tied. The animal died at the beginning of the sixth day, without having experienced any remarkable symptoms. On opening the body, the organs were found without any discernible alteration : no doubt this animal died in consequence of the operation. This experiment was repeated at noon, on a dog of middle size, with one ounce of the same powder. Seven hours after, the animal did not appear indisposed. The next day at noon he was walking about freely, and uttered no complaint. He did not appear more ill the

following day at one o'clock. The next day he was able to walk about freely, but began to complain, and kept himself generally lying down on the side: the pupils were not more dilated, than in their natural state; the inspirations were deep and rare: he saw and heard very well. He died in the night. He was opened the next day, at seven in the morning: the blood contained in the heart was still fluid; the lungs were sound; the stomach contained almost the whole of the powder ingested; no vestige of inflammation was perceived in the digestive canal, except in the interior of the rectum, which presented a few reddish spots.

Experiment 3rd. On the 22nd of April, at one o'clock, a small dog was made to swallow an ounce and half of the fresh root of *Conium maculatum:* the œsophagus was tied. Forty-eight hours after, he had experienced nothing. The next day, the 23rd, an ounce of the same root bruised, and eight ounces of juice proceeding from three pounds of the root well pounded, with two ounces of water, were introduced into the stomach of a dog: the œsophagus was tied. Twenty-four hours after, the animal had not presented any remarkable symptom: the 25th of April, at noon, these two animals were only somewhat dejected.

Experiment 4th. The same day, about four pounds of the leaves and stalks of fresh Hemlock were triturated, and fourteen ounces of juice, which they furnished, were given to a small robust dog: the œsophagus was then tied. A quarter of an hour after, the animal made efforts to vomit; he experienced vertigoes, and a slight trembling of the posterior extremities. Three hours after, he was found dead. He was opened the next day. Almost all the juice was still in the stomach; the mucous membrane of this viscus was of a bright red throughout its whole extent; the other parts of the digestive canal appeared sound; the lungs were distended with blood, still fluid; they presented here and there livid patches,

dense, and but little crepitating; the blood contained in the ventricles of the heart was partly fluid, and partly coagulated.

Experiment 5th. On the 31st of May, at seven in the morning, about eight ounces of the juice proceeding from two pounds of the leaves of Hemlock, were introduced into the stomach of a young dog of middle size, and the œsophagus was tied. Ten minutes after, the animal made efforts to vomit. At ten, he uttered some plaintive cries; the muscles of the extremities presented from time to time some slight contractions; he walked with tolerable freedom. At half past twelve, he was found dead. He was immediately opened. His body was still warm: the blood contained in the right ventricle of the heart was black, and completely coagulated; that of the other ventricles was fluid, and of a deep red colour: the lungs were the same as in the preceding experiment; the stomach contained almost the whole of the juice ingested; its coats did not appear altered; the interior of the rectum, which was covered with a portion of the juice, presented several reddish spots.

Experiment 6th. A small dog was made to swallow two drachms of the watery extract of Hemlock, bought of an apothecary. The next day, the animal was in excellent health, and had experienced nothing.

Experiment 7th. The same experiment was repeated at seven in the morning, on a small weak dog, with an ounce of the same extract dissolved in three ounces of water: the œsophagus was then tied. Ten minutes after, the animal made efforts to vomit, which were repeated five times in the twelve following minutes. At eight, he passed one solid stool; for the rest he experienced nothing during the day. The next day, at ten in the morning, he was sinking a little; nevertheless he preserved the faculty of hearing and walking. He died at five in the evening, that is to say, *thirty-four hours after the ingestion of the extract.* He was opened the same day. The

heart contained black and coagulated blood; the lungs presented several livid spots; the interior of the stomach and rectum was slightly inflamed.

Experiment 8th. In order to be better able to judge of the difference existing between this extract, and that of another apothecary, we shall report the following fact. At eight in the morning, seven drachms and a half of the watery extract of Hemlock, prepared by another apothecary, and dissolved in three ounces of water, were introduced into the stomach of a small and very strong dog: the œsophagus was tied. At the end of five minutes, the animal passed one solid stool. At ten minutes past eight, he made some efforts to vomit, which he repeated twelve minutes afterwards. At twenty-five minutes past eight, he already experienced decided vertigoes; his head was extremely heavy; he had another liquid stool. At half past eight, he fell down on his side, and appeared to be dead; the organs of sense and motion no longer performed their functions; the animal might be displaced like an inert mass of matter, and it was impossible for him to support himself one moment on his feet; from time to time, however, he presented some convulsive motions in the lower jaws; the breathing was carried on in a manner almost insensible. At thirty-six minutes past eight, the movements of the jaws were diminished, and five minutes after, they ceased entirely; the animal died at the same moment, that is to say, *forty-one minutes after the ingestion of the extract.* He was immediately opened. The heart was contracting with some force; the blood contained in the left ventricle was fluid, and of a bright red colour; the lungs presented the rose colour, which is natural to them; there was no alteration in the digestive canal.

Experiment 9th. Forty grains of the extract of Hemlock, bought of the same apothecary who had furnished that used in the sixth experiment, were applied to the cellular texture of the back of a small dog. Seven days after, the animal had

not experienced any remarkable symptom; he had constantly eaten with an appetite.

Experiment 10th. At seven in the morning, an incision was made in the inside of the thigh of a small robust dog; three drachms of the same extract were introduced into the wound, and the lips were united by suture. Two days after, at noon, the animal did not appear to have experienced any inconvenience. He died five days after the operation, and did not exhibit any remarkable symptom. No alteration in the digestive canal; the lungs were livid, exhibiting a multiplicity of spots, which were blackish, and gorged with blood; the wound somewhat inflamed; little or no infiltration in the limb.

Experiment 11th. At a quarter past eight, *two drachms of the watery extract of Hemlock, prepared by evaporating in a water-bath the juice of the fresh plant, and mixed with two drachms of water*, were applied to the cellular texture of the inside of the posterior extremities. The animal quickly began to experience the symptoms related in experiment 8th. At half past nine, he was lying down on the side; the breathing was performed slowly; the muscles of the extremities were agitated by slight convulsive movements; they exhibited a general trembling. The animal died at the end of five minutes more, that is to say, one hour and twenty minutes after the application of the extract to the cellular texture. He was opened the next day. The limb operated on was not much inflamed; the digestive canal did not present any alteration; the blood contained in the ventricles of the heart was partly fluid, partly coagulated; the lungs presented several livid patches; their texture was dense, and but little crepitating.

Experiment 12th. Twenty-eight grains of the watery extract of Hemlock, dissolved in four drachms of water, and similar to that of the 6th, 9th, and 10th experiments, were injected into the jugular vein of a small robust dog. Instantly

the animal experienced considerable vertigoes; he fell down on the side; his extremities were agitated by convulsive movements; the organs of sense became insensible, and the head was reflected on the back. He died at the end of two minutes. He was opened a moment after. The blood contained in the heart was fluid, and of a red colour not very bright in the left ventricle; the lungs were somewhat shrivelled and less crepitating than in their natural state.

Another animal placed under the same circumstances, furnished similar results.*

Experiment 13th. Twelve grains of the same extract, dissolved in two drachms of water, were injected into the jugular vein of a small dog. Four minutes after, the animal appeared a little sleepy; his breathing was accelerated, and he did not attempt to walk. These symptoms disappeared, and the next day the animal was perfectly recovered.

Experiment 14th. Two drachms of the *resinous* extract of Hemlock, prepared with the dry powder, were applied to the cellular texture of the back of a small dog. Six days after, the animal had not experienced any thing, and appeared to be in good health.

Experiment 15th. The same experiment, repeated upon another dog, with this difference, that the wound had been made in the inside of the thigh, presented the same results. Three days after, the animal was in good health, and made his escape.

Experiment 16th. Two drachms of the same extract were applied to the cellular texture of the back of a small dog. Six days after, the animal, who had constantly refused food, died in a state of dejection, without having experienced any vertigoes. On opening the body no lesion could be discovered.

* Thirty-two grains of the same extract, injected into the jugular vein of a *very strong* dog, did not produce any symptoms. Two days after, the same quantity was injected into the vein on the other side; the animal experienced nothing.

Experiment 17th. Twelve grains of the resinous extract of Hemlock, suspended in two drachms and a half of water, were injected into the jugular vein of a small robust dog. Immediately, the animal uttered plaintive cries, he experienced considerable vertigoes, and fell down on the side; the head was strongly reflected upon the back; the legs stretched out, and separated from one another; they were agitated by convulsive movements: these symptoms lasted nearly three minutes: then insensibility of the organs of sense, dilatation of the pupils, general tranquillity, very remarkable coma; trembling of every part of the body. He died six minutes after the injection. The body was immediately opened. The heart was quivering; the blood contained in the left ventricle, was of a vermillion red colour, and partly coagulated; the right ventricle was almost empty, and the lungs were in their natural state.

Observations.

1st. " Being in garrison at Torrequemada in Spain, I was called at seven in the evening, on the 2nd of March, 1812, to visit a grenadier, who was reported to be dying. I found the patient in a profound sleep, without sense, respiring with extreme difficulty, and lying on the ground on a little straw, in a small narrow low room, close shut, and filled with people and with smoke. His pulse small, hard, and slow, even to thirty pulsations in the minute; the extremities were cold; the face bluish, and distended with blood, like that of a person strangled. The patient was placed in the fresh air. I was informed that he had eaten, together with several of his comrades, some broth into which Hemlock had been put; and that since supper, the whole were as if drunk, and felt pains in the head and throat; that this grenadier, who had commonly a good appetite, had eaten a greater quantity of it than the rest, and immediately after having supped, had undressed himself, lain down, and gone to sleep, whilst the others still

remained at table to converse together; that an hour and half after, when they had begun to find themselves indisposed, they had remarked that this man was groaning and breathing with difficulty, which had determined them to have me called. I hesitated for a moment, whether I should begin by making him swallow, in large quantity, some hot vinegar, in order to neutralize, by this antidote, the effects of the narcotic; or by opening the jugular vein, in order to remedy speedily the manifest congestion of blood towards the head; or, in fine, by evacuating the poison by the shortest way: however, I determined on the administration of an emetic. I made him swallow twelve grains of emetic tartar, dissolved in warm water; and caused him to inhale the steam of vinegar. Cold fomentations were applied to the head, and dry and hot frictions to the extremities, in order to recal the circulation, and diminish the cerebral congestion: half an hour after having taken the emetic, the patient began to make some fruitless efforts to vomit, and in a short time his situation, which had given some hope before, grew visibly worse, nevertheless he still spoke, and complained of being very cold; but in a short time he lost again the use of speech and knowledge, and shewed only by continual palpitations of the breast, and of the epigastric region, the extreme anguish with which he was tormented. Then, without waiting longer the effect of the vomit, I ordered him to swallow some hot vinegar, and the frictions to be kept up without intermission, whilst I went to seek a lancet to open the jugular vein; but I arrived too late, for the patient had ceased to live a few moments before my return, three hours after the fatal supper.

" *Dissection.* The stomach was half filled with crude broth; there were round the pylorus some red spots; the liver was very voluminous; there was no alteration in the intestines; the *vena cava* and the heart were emptied of blood; the pectoral cavity was narrow; the left lobe of the lungs was sound, but the right lobe was entirely destroyed by a preced-

ing suppuration. (This man, who was thirty-five years of age, was robust; he had experienced from time to time a dry cough, and his breathing was painful.) On opening the cranium, there flowed out a sufficient quantity of blood to fill twice an ordinary chamber-pot; the vessels of the brain were extremely gorged with blood." (Observation of *M. Haaf*, Chirurgien Aide-major. *Journal de Médecine de M. Leroux*, tom. xxiii. p. 107, Fevrier.)

2nd. " A man was attacked by a large cancerous ulcer, which had already destroyed the *Velum Palati*, and produced a caries of part of the vault of the palate. A slight delirium, and some syncopes obliged him in a short time to suspend the use of the extract of *Conium Maculatum*, which was given afterwards with advantage in a more moderate dose. This extract had been prepared at *Puerto-Real* in Andalusia, after the method of Storck. The dose however had been by very insensible degrees carried as far as sixteen Décigrammes *(about half a drachm);* which proves that in the southern countries, some vegetables enjoy more energetic properties than in the north." (CHOQUET, *idem*, Avril, 1813. p. 359.)

3rd. *Agasson* speaks of a man who had taken Hemlock, and who had all the superior parts of the body affected by convulsions, whilst the inferior parts were paralysed. A furious delirium has sometimes been observed in other persons.

4th. An Italian, who cultivated vines in his own country, found amongst them a plant of this kind, which he took for a parsnip; he ate the root of it for his supper, together with his wife; they went to bed after this meal. In the middle of the night, they awoke completely mad, and began running here and there without a light over the whole house, in a fit of madness and fury; they struck themselves so rudely against the wall, that they were bruised all over, and their face particularly, and eyebrows, appeared all swelled and bloody: suitable medicines were administered to them, and they were restored to health. (VICAT, *Op. citat.* p. 274.)

It results from the preceding facts,

1st. That the fresh leaves of Hemlock furnish, at a certain period, a juice which possesses energetic poisonous properties; and that which is obtained from the roots at the same time, possesses little activity.

2nd. That the watery extract prepared *by evaporating in a water-bath, the fresh Hemlock*, preserves the greatest part of the properties of the plant; whilst at the same time it possesses but little activity, and sometimes is even altogether inert, when obtained by boiling the dry powder in water, and evaporating the decoction at an elevated temperature.*

3rd. That these different preparations produce effects more rapid and more decided, when injected into the jugular vein, than when applied to the cellular texture, and for a still stronger reason than when introduced into the stomach.

4th. That they are absorbed, carried into the circulation, and exert an action on the nervous system, and more particularly on the brain.

5th. That independently of this action, they exert a local irritation, capable of producing an inflammation more or less violent.

* There are to be found in commerce, a multitude of extracts of Hemlock, which may be regarded, with respect to their properties, as holding a middle station with those here spoken of: some have little or no medical virtues, others have more; and there are some which are totally inert. We were one day in the shop of an apothecary, who had several times furnished us with the extract of Hemlock, which we have administered to dogs, to the dose of ten drachms, without producing any serious accident. We endeavoured to prove to him that the medicine was badly prepared, and in order to convince him effectually, we swallowed, in the presence of several persons, who happened to be in his shop, a drachm of this extract (seventy-two grains) dissolved in two drachms of water. We felt no effect from it, whilst twenty or thirty grains of the extract well prepared, would have probably proved fatal to us. Let it be conceived now, what advantage a person is likely to derive from such an extract, who takes *one or two grains* of it per day, or even thirty or forty, with the hope of getting rid of a scirrhous tumor, or of any other disease.

OF WATER HEMLOCK (*CICUTARIA AQUATICA* OF *LAMK*, OR *CICUTA VIROSA* OF LIN.).

926. This plant belongs to the family of the *Umbelliferæ* of Jussieu, and to the Pentandria Digynia of Linnæus.

Characters. Flowers white, almost regular, and disposed in loose umbels: general involucellum none, or of one single leaflet: partial involucellum composed of several leaflets, which extend beyond the partial umbels; each flower presents an entire calyx; the petals are oval, entire, curved at the summit, almost equal: the fruit is egg-shaped, furrowed; each seed is convex on the outside, and furnished with five small ribs: stalk from three to eight decimetres in height, cylindrical, hollow, and branchy: leaves large, twice or thrice winged, and composed of lanceolated leaflets, somewhat narrow, pointed, and dentated like a saw. This plant grows on the borders of ponds, and in watery ditches.

ACTION OF WATER HEMLOCK ON THE ANIMAL ECONOMY.

Experiment 1st. *Wepfer* relates that half an hour after having given to a young dog more than an ounce of the root of Water Hemlock, cut into very small pieces, the animal passed a great quantity of saliva, vomited, had a mouthful of foam, and fell into very violent convulsions; at one time he presented an emprosthotonos, at another opisthotonos; he could not remain in his place; he staggered and fell down on his side. This situation continued two hours. The animal recovered his strength; a fresh portion of the root was given him; he passed a quantity of saliva immediately after, had a stool, and did not vomit; he lost his appetite, had convulsive movements from time to time, and when raised up, he immediately fell

down on the side. He lived until the third day. His death was preceded by great torments, and a considerable agitation. The stomach, which was contracted and puckered, contained only the entire roots, such as they had been ingested; the internal membrane, which was more red than in its natural state, presented near the bottom, where the small portions of the root were found, some spots of a livid red colour; the serous membrane corresponding to these spots, presented similar ones, but larger; the intestines, which were quite empty, were contracted, and as it were dried; the rectum was lined with a greenish mucosity; the bladder was small, empty, and in folds; the ventricles of the heart contained a great quantity of black concrete blood.

This experiment having been repeated by the same author on dogs, wolves, eagles, sometimes with the root, sometimes with the juice, of the Water Hemlock, furnished similar results; in general, it has been observed that the animal staggered a short time after the ingestion of the poisonous substance; that they were dejected or agitated, and that their heads trembled; some time after, they experienced thirst, and a frequent eructation; they rendered a great quantity of saliva, with a greenish foam; symptoms which were speedily followed by vomitings, diarrhœa, enuresis, and convulsions more or less violent. Amongst the animals submitted to these experiments, there was a very small number who experienced no accident at all. Those who died exhibited the digestive canal inflamed, corroded, and sometimes in a state of gangrene; the cavities of the heart were filled with blood, sometimes fluid, sometimes concrete; the lungs, which were frequently filtrated, and distended with blood, appeared to be inflamed; the liver presented the same appearance; the ventricles of the brain seemed to contain a little serosity; the vessels of this organ were distended with black blood.*

* Wepfer, *Cicutæ Aquaticæ Historia et Noxæ*, p. 135—176, anno 1679.

Observations.

1st. *Mæder*, six years of age, accompanied by a child of eight years, and by six little girls, ate some roots of Water Hemlock, which he took for parsnips. Soon after, he experienced anxiety of the præcordia, uttered a few words, lay down, and made water with considerable force; shortly after which he fell a prey to horrible convulsions, lost the use of his senses, and strongly closed his mouth: he gnashed his teeth, rolled his eyes about in an extraordinary manner, and rendered blood by the ears. He had a frequent hiccup; made efforts to vomit, without being able to open his mouth; he experienced severe pains in the joints; his head was frequently bent backward, and the whole back was arched so that a little child might with safety have crept through the space formed between his back and the bed. The convulsions having ceased, he implored the assistance of his mother: whatever means were employed, it was impossible to raise him; his strength diminished, and he expired about half an hour after the invasion of the symptoms. The abdomen and the face swelled up after death; a small degree of lividness was observed near the eyes; there flowed from the mouth a very considerable quantity of green froth, which continued to appear as fast as it was wiped away. Amongst the other children who had likewise eaten the roots of this plant, the six little girls experienced bad symptoms, and recovered; but the child of eight years of age, who took a tolerably large quantity, died.

2nd. In consulting the other observations given by *Wepfer* in the *Miscellanea Curiosa*, those of *Schwencke*, *Niedlinus*, &c. It will be seen that the following symptoms have been noticed: "Dazzling, obscurity of the sight, vertigoes, cephalalgia sometimes acute and excruciating, walk vacillating, agitation, anxiety of the præcordia, cardialgia, dryness of the throat, ardent thirst, eructation, vomiting of greenish matter, with fragments of the roots, respiration frequent and interrupted, tetanic contraction of the jaws, lipothymia, sometimes

followed by a state of lethargy, with coldness of the extremities; at other times a furious delirium, or attacks more or less approaching to epilepsy, especially in children and young girls, and they are then frequently terminated by death: in one or two cases only, a swelling of the face has been observed, with starting of the eyes. The most serious derangement of the nervous system has always been observed, so much the more rapidly as the quantity of the root swallowed has been more considerable, at least, unless a part of it had been quickly thrown up by vomiting. (GUERSENT, *Dictionnaire des Sciences Médicales,* article *Cigue.)*

927. It results from the preceding facts,

That the *Cicuta Virosa* or *Aquatica,* exerts upon men and upon dogs an action similar to that of the *Conium Maculatum,* but more energetic.

COMMON FOOL'S PARSLEY *(ÆTHUSA CYNAPIUM).*

928. This plant belongs to the family of the *Umbelliferæ* of Jussieu, and to the Pentandria Digynia of Linnæus.

Characters. Flowers white, forming flat umbels, very thickly furnished, and destitute of a general involucrum; partial involucella disposed on one side of the umbel, and turned downwards. Each flower has an entire calyx, the petals are unequal, curved into the form of a heart; the fruit is egg-shaped or oblong, streaked or furrowed: stalk five decimetres in height, branchy, smooth, and grooved; its leaves are all twice or thrice winged, and their leaflets are pointed and pintifid, or deeply indented.

This plant has often been confounded with parsley. The following are the characters which may serve to distinguish them: 1st. The leaves of the Fool's Parsley are of a blackish green on the upper side, and shining.

2nd. They have no smell when smelt to without being

bruised; but they give out a nauseous smell when rubbed between the fingers; parsley on the contrary, presents an agreeable odour.

3rd. Its root is smaller than that of parsley, and dies every year in autumn. This plant is common in cultivated grounds.

ACTION OF COMMON FOOL'S PARSLEY ON THE ANIMAL ECONOMY.

Experiment. On the 10th of June, at eight in the morning, about seven ounces of juice obtained from the leaves of this plant, were introduced into the stomach of a robust dog of middle size, and the œsophagus was tied. Twenty minutes after, the animal had some retchings. At half past eight, he did not appear very ill. All at once he extended his extremities, and lay down on his belly. A few minutes after he attempted to rise; all his efforts were in vain; the muscles of the limbs, especially of the inferior ones, refused to obey; the animal was lifted up, and instantly fell again. The organs of sense still exercised their functions; the pupils were dilated; the pulsations of the heart were slow and strong. This state of things continued for a quarter of an hour; when the extremities were agitated by convulsive movements; the animal might be placed, without deranging him, on either side; the organs of sense grew weak; the œsophagus and throat became the seat of spasmodic contractions. This state of stupor increased, and the animal expired at nine o'clock. He was immediately opened: the heart was contracted, and contained some fluid and blackish blood, even in the left ventricle; the lungs were somewhat less crepitating than in their natural state; the stomach was found full of the juice ingested; there was no alteration in the digestive canal.

Observations.

1st. A boy six years of age, having eaten of this plant at

four in the afternoon, which he took for parsley, began immediately to utter cries of anguish, and complained of cramps in the stomach. Whilst he was going from the country to his father's house, the whole of his body became excessively swelled, and had a livid appearance; his breathing became every moment more difficult and short. He died towards midnight. Another child, four years of age, who was poisoned in the same manner, was fortunate enough to vomit up the plant; that however did not prevent him from going out of his senses, and talking extravagantly; in his delirium he thought always of seeing a quantity of dogs and cats; and although the physician did not arrive till next day, he was fortunate enough to save him. (VICAT, op. citat. p. 255.)

2nd. RIVIERE relates, that a person died after having taken a quantity of this plant. On opening the body, the tongue was found black; a brownish serosity was found in the stomach; the liver was hard, and of a yellow colour; the spleen livid; the body was not at all emphysematous.

3rd. In examining attentively the symptoms observed by several practitioners in poisonings of this kind, they may be reduced to the following: heat in the throat, thirst, vomitings; sometimes diarrhœa; breathing short, and sighing; pulse small, and frequent; head-ache, vertigoes, numbness of the limbs, and delirium.

OF RUE *(RUTA GRAVEOLENS).*

Experiment 1st. On the 4th of June, at eight in the morning, six ounces of the juice obtained by triturating two pounds of the leaves of fresh Rue, with one ounce of water, were introduced into the stomach of a strong dog of middle size; the œsophagus was then tied. The animal had one stool during the day. The next day, he did not experience any remarkable symptoms. He died in the night. The

mucous membrane of the stomach was slightly inflamed; the other portions of the digestive canal were sound; the lungs presented no alteration.

Experiment 2nd. About eight ounces of the distilled water of Rue prepared from the dry plant, were introduced into the stomach of a small dog; the œsophagus was tied. He had experienced no other symptom than dejection, and died five days after the operation. The body was not opened.

Experiment 3rd. About eight ounces of the distilled water of Rue, prepared from a large quantity of the fresh plant, was introduced into the stomach of a small dog: the animal did not experience any accident. Six days after, he died dejected, probably in consequence of the ligature of the œsophagus.

Experiment 4th. Twelve drachms of the distilled water of Rue, prepared from the fresh plant, were injected into the jugular vein of a small lean dog. The next morning, the animal had not experienced any remarkable symptoms. The jugular vein of the other side was then laid open, and three drachms of the same fluid, mixed with eight grains of essential oil proceeding from a distillation in a water-bath of about eight pounds of the fresh plant, were injected into it. Two minutes after the injection, the animal vomited some yellow matter, and experienced vertigoes; he staggered like a person drunk with wine. At the end of twenty minutes, his posterior extremities appeared somewhat feeble. Six hours after, all the symptoms were diminished, and the next evening, the animal was perfectly recovered.

Experiment 5th. Three drachms and a half of the watery extract of Rue, prepared from the dry plant, were injected into the stomach of a small dog tolerably robust; the œsophagus was tied. He died at the end of the fourth day, and had exhibited no other symptom than the dejection inseparable from the operation. The mucous membrane of the stomach

presented two ulcers of the size of small lentils; there were here and there near the pylorus some blackish portions formed by black blood extravasated.

Bulliard says, " In a dose a little too strong, Rue causes a great agitation, fever accompanied by yawnings, a considerable dryness of the mouth, and a great pain in the throat. The skin, if it be handled any length of time, inflames, and the hands swell. (Op. citat. p. 150.)

929. It results from these facts:

1st. That Rue exerts a local irritation, capable of producing an inflammation, which in general has not appeared to us to be very severe.

2nd. That its essential oil, when introduced into the veins, acts like the narcotics, and that it is probable it exerts the same mode of action when introduced into the stomach; but that it possesses little energy.

OF COMMON OLEANDER *(NERIUM OLEANDER).*

930. This shrub belongs to the Pentandria Monogynia of Linnæus, and to the family of the *Apocyneæ* of Jussieu.

Calyx permanent, very small, with five linear and acute divisions: corolla monopetalous, funnel-shaped; its tube dilates insensibly; its border is large, open, and deeply intersected, in five obtuse and oblique divisions, furnished at their interior base with appendages resembling petals, coloured, dentated, split into two or more lobes, projecting outside the tube, and forming a fringed crown: five stamina inserted into the tube, the anthera of which are straight, close together, terminated by a coloured thread, or by silky tassels rolled up in a spiral, one over the other; one style simple, scarcely visible; its stigma, which is abrupt, is borne upon an annular ridge; germen superior and oblong; the fruit is composed of two conical follicles, terminating in a point, in which are

found the seeds clustered together, which cover one another like the scales of fishes: flowers terminal, and in loose clusters, of a rose colour, or white. The shrub is from eight to ten feet high; the stalk is straight, the bark purple, green, or grayish; the branches long, slender, and erect; leaves with short petioles, opposite, frequently ternate, lanceolated, somewhat narrow (they are nearly four inches long to nine lines of breadth in the middle), entire, pointed, smooth, stiff, of a dark green colour, having a strong rib on the lower side. The root is woody and yellowish, it gives out several stems that are straight and pliable. The whole plant has a bitter taste, extremely acrid.

ACTION OF COMMON OLEANDER ON THE ANIMAL ECONOMY.

Experiment 1st. At half past one, an incision was made on the back of a great dog; fifty grains of the watery extract of Oleander, moistened with a few drops of water, were applied to the cellular texture. At the end of ten minutes, the animal had vomited three times some yellowish fluid matter. Three minutes after, he had two stools and vomited again. These vomitings were repeated several times during the succeeding six minutes; then slight complaints, vertigoes, acceleration of the pulsations of the heart, weakness of the posterior extremities; head bowed forward as if it were difficult to support it; slight convulsive contractions of the right anterior paw. One minute after, the animal fell down without an effort on the side; his head was reflected backwards, and he became insensible to light and sound; the pupils were extremely dilated, the anterior right extremity presented from time to time some slight convulsive movements. He died in this state eight minutes after. The body was immediately opened: the heart was no longer beating; there was in the left ventricle a small quantity of blood of a deep red colour,

partly coagulated; that contained in the other ventricle was partly fluid, and partly coagulated; the lungs, which were of a rose colour, were somewhat less crepitating than in their natural state; the ventricles of the brain contained no serosity; the external vessels of this organ presented a livid colour, and were distended by a tolerably large quantity of venous blood. There was no alteration in the digestive canal, nor in the limb operated on.

Experiment 2nd. At a quarter past one, the experiment was begun again with forty-eight grains of the same extract. At the end of eight minutes, the animal vomited alimentary matter mixed with bile. Two minutes after, he vomited again, he passed two liquid stools, and experienced slight vertigoes. Twenty-six minutes after the operation, he made violent and fruitless efforts to vomit; his walk was staggering, his posterior extremities weak, and he fell down on the side, reflecting strongly his head backwards upon the trunk; the muscles of the lower jaw, which were agitated by convulsive movements, approached and separated alternately this bone from the superior jaw. The anterior extremities exhibited a continual trembling, and the posterior paws slight convulsive shocks; the organs of sense were insensible to external impressions. This state continued eight minutes, and the animal died. He was immediately opened: the blood contained in the cavities of the heart was fluid, and of a red somewhat deep in the left ventricle. The lungs and stomach presented no alteration.

Experiment 3rd. At twelve o'clock two drachms of the watery extract of Oleander, dissolved in two drachms and a half of distilled water, were introduced into the stomach of a small robust dog fasting, and the œsophagus was tied. Twelve minutes after, the animal had some nauseas, made some efforts to vomit, and experienced slight vertigoes; the pulsations of the heart were not more frequent than before the operation. At sixteen minutes after twelve, the stupefaction was so much

increased, that he appeared to be dead; he was lifted up, and fell down instantly on the side, like an inert mass of matter; he was insensible to all external impressions. Three minutes after, he reflected the head a little on the back; the anterior paws, and especially the right one, were agitated with slight convulsive movements, and he expired twenty-two minutes after the ingestion of the poisonous substance. He was immediately opened: the heart was no longer contracting; the blood which it contained was fluid, and somewhat of a deep red in the left ventricle; the lungs, which were rather less crepitating than in their natural state, were rose-coloured, and very little distended with blood; the stomach contained a certain quantity of the poison employed; the digestive canal presented no sensible alteration.

Experiment 4th. Four and twenty grains of the watery extract of Oleander, dissolved in four drachms of water, were injected into the jugular vein of a small dog. The animal immediately experienced very decided vertigoes, and was unable to walk. At the end of a minute, he vomited some fluid matter, of a yellowish colour, and exhibited a continual trembling in the posterior limbs; he was lying down upon the side, with the legs separated and extended, and the head somewhat bent backward; he uttered some plaintive cries; his pupils were excessively dilated, his eyes starting, that he could neither hear nor see; from time to time he made motions with the head as if he would attempt to rise; but he fell back again immediately. These symptoms lasted seven minutes, and he expired directly after, in a state of great insensibility and immobility. He was immediately opened: the heart was no longer contracting, and contained only some fluid blood; that in the left ventricle was of a blackish red colour: the lungs did not appear altered.

Experiment 5th. Thirty-six grains of the same extract, dissolved in four drachms of water, were injected into the jugular vein of a small robust dog, immediately the muscles

of the extremities were contracted, the paws separated, and the head bent backwards. Three minutes after, the stiffness ceased, the head was a little inclined towards the thorax, and the animal appeared completely stupified. He lived five minutes in that state, and death was preceded by a general trembling of all the muscles. He was immediately opened: the heart was motionless; the blood, which was of a red colour in the left ventricle, was fluid in each of the cavities of this organ; in the right ventricle however, were observed some very trifling *coagula*, which were blackish, and as it were composed of filaments; the lungs, which were crepitating and of a rose-colour, presented several blackish points.

Experiment 6th. A drachm of the same poisonous substance, dissolved in five drachms of water, was injected into the jugular vein of a very strong dog. Immediately the animal uttered acute cries, was considerably agitated, experienced vertigoes, and fell down on the side: he then stretched out and strongly agitated his paws; the head was reflected backward, and he ceased to complain. This state continued for two minutes, after which he became motionless, and as if insensible: he made two deep inspirations, and died four minutes after the injection. He was immediately opened: the heart was no longer contracting; the blood, which was tolerably abundant and fluid in both ventricles, was of a deep red in the aortic portion; the lungs were rose-coloured, and their texture somewhat more hard than in their natural state; the pulmonary vessels were empty.

Experiment 7th. Ten ounces of the distilled water of Oleander, prepared from sixteen ounces of the powder of this plant, were introduced at eight in the morning into the stomach of a robust dog; the œsophagus was tied. The next day at five in the evening, the animal had not presented any remarkable phenomenon. The following day at six in the evening, he experienced vertigoes. The morning after, at ten o'clock, he was lying on the side, in a state of great insensibility, and

exhibited some slight convulsive movements: he died three hours after. The ventricles of the brain contained a small quantity of a reddish serosity; the veins distributed over the external surface of this organ, were distended with black blood; the lungs, which were crepitating, were rather more red than in their natural state.

Experiment 8th. Six drachms of the same distilled water of Oleander, were injected into the jugular vein of a small robust dog. The next day the animal was in excellent health; he had not experienced any remarkable symptom; food was given to him. The following day, ten ounces of the same fluid were introduced into his stomach, and the œsophagus was tied. He died at the end of fifty hours, after having experienced vertigoes, and some convulsive movements.

The same experiment repeated on another animal, furnished similar results.

Experiment 9th. At twelve o'clock, an incision was made on the inside of the thigh of a small dog; the wound was sprinkled over with four drachms of the powder of Oleander, which had been slightly moistened; and the lips were united by a few stitches. Twenty minutes after, the animal vomited some bilious matter extremely yellow: these vomitings were repeated at the end of four minutes. At half past one, he was laboring under the symptoms reported in experiment 3rd, and died ten minutes after. The dissection, which took place the next day, did not discover any sensible lesion.

Experiment 10th. At eleven o'clock, four drachms of the same powder were introduced into the stomach of a small and very strong dog, and the œsophagus was tied. At half past twelve, the animal made some efforts to vomit; his walk was unimpeded, and he preserved the use of his senses. At three quarters after one, he experienced vertigoes, and the other symptoms which have followed the use of this extract (*Vide* the preceding experiments), and died twenty minutes after. He was opened at three: the blood contained in the

ventricles of the heart was fluid; the lungs were rose-coloured and crepitating; the stomach contained almost the whole of the powder ingested, which was recognisable by its physical properties. There was no alteration in the digestive canal.

Observations.

1st. *Libautius* asserts that a person died in consequence of being shut up in a room to sleep, where there were some flowers of this plant. Another person, who ate some meat roasted on a spit made of this shrub, experienced considerable agitation, became mad, had a syncope, and died. (Libautius, *Comment. de Venenis;* Schenkins, *de Venenis.*)

2nd. *M. Gronier* has administered three drachms of the powder of Oleander to a she-ass, which was extremely feeble; the animal seemed to be very considerably excited. A vigorous horse, who had taken the same poison, fell into a state of dejection; he fell asleep, and expired eighty minutes after. (*Memoire lu à la Société de Médecine de Lyon,* en 1816.) Sheep die in a very short time, after having drunk the water in which the leaves of Oleander have been macerated.

931. It results from the preceding facts,

1st. That the watery extract of this plant, when applied to the cellular texture, or introduced into the stomach, is a very active poison, and that it acts with considerably more rapidity and energy, when injected into the veins;

2nd. That the powder possesses also poisonous properties, but in an inferior degree;

3rd. That the distilled water is still less active than the powder; that these different preparations are absorbed and act upon the nervous system, and especially on the brain, after the manner of the stupifying poisons;

4th. That they almost constantly produce vomiting;

5th. That independently of these phenomena, they excite a slight local irritation.

OF THE *UPAS-TIEUTÉ.*

932. The *Upas-tieuté* brought from Java by *Leschenault,* is nothing else than the extractive juice of a plant of the vine kind, of the family or genus of the *Strychnos,* (a small group ranged by M. de Jussieu, next to the *Apocyneæ*). The word *Upas* signifies a vegetable poison, and the natives of Java employ two species of it, for the purpose of rendering the wounds of their arrows mortal : the first is the *Upas-tieuté,* which is produced by a climbing plant; the second is called *Upas-antiar,* and is the produce of a large tree. These two species have been greatly confounded by writers, under the names of *Boa,* or of *Bohon-upas.*

ACTION OF *UPAS-TIEUTÉ* ON THE ANIMAL ECONOMY.

Experiment 1st.* When small pieces of wood, of the size and form of an ordinary quill, are covered with the *Upas-tieuté,* and the extract is left to dry upon their surface; and these are forced into the muscle of the thigh of a dog, it is observed that, at the end of two or three minutes, the animal experiences a general uneasiness, and seeks the corners of the room; almost immediately after, all the muscles of the body contract, the vertebral column straightens itself, and the anterior feet for a moment quit the ground. This contraction is only momentary, the animal becomes quiet for a few seconds;

* My friend *Dr. Magendie,* who has already enriched physiology with several important labours, read, in 1809, to the Institute, a very fine memoir, in which he has first spoken of the effects of this substance on the animal economy. The experiments which form the subject of it, were made by him, and *M. Delille,* a distinguished botanist, and a member of the Institute of Egypt: I have since repeated them, and found them extremely correct.

then a second general contraction takes place; this is more decided than the first, and of longer duration; the straightening of the vertebral column is more sensible; the breathing accelerated. These symptoms cease on a sudden, the breathing becomes slower, the animal appears as if astonished. To this calm, which scarcely lasts a minute, succeeds again a strong general contraction; the anterior limbs, which are stiff, and closed together, are directed backwards, the breathing is considerably accelerated, the vertebral column straightened, and the head strongly elevated, and bent backwards on the neck. The breast being no longer supported, the animal, threatened by a fall, runs rapidly upon his hind legs, whilst a more intense contraction manifests itself; the muscles of the spine elevate the breast and head, the posterior limbs become stiff and motionless, the animal falls, first on the lower jaw, and soon after on the side. He then exhibits a complete tetanus, with immobility of the thorax, and cessation of respiration; the tongue and gums, which are of a violet colour, announce a state of asphyxia. This state continues about a minute, then the tetanus disappears on a sudden, and the asphyxia a little at a time, in proportion as the breathing is restored. During this paroxysm, the animal preserves the use of his senses, and of the functions of the brain; it is not till the asphyxia is carried to the highest degree, that the action of these organs begins to weaken. At the end of another minute, fresh general contractions, so intense, that the floor experiences an evident trembling. This shock may be compared to that which takes place, when a current of galvanic fluid is directed along the spinal marrow of an animal recently killed; it is accompanied by asphyxia, and a little before it disappears, convulsive movements are observed in the face. The touching of any part of the body whatever, produces easily this general tetanic stiffness; the animal dies five, six, seven, or eight minutes after the first attack. The state of the internal organs proves that he has died of an

asphyxia; the examination of the wound shews that the poisonous substance has introduced itself into the muscles; and every part with which it has come in contact is tinged of a brownish yellow colour. Horses and rabbits furnish the same results, only that the attacks of tetanus are more numerous in those who are vigorous and adult.

Experiment 2nd. The right thigh of a dog was amputated, leaving the traces of the crural vein, and artery near the pelvis; those vessels were detached from all the surrounding parts, which had been cut; the vessels divided in the operation were tied; the femur was sawed through, so that the circulation was only carried on in the thigh, through one vein and one artery; linen and saw-dust were placed between the divided surfaces, in order to prevent their communication. A point of wood, furnished with three grains of *Upas*, was forced into the isolated limb near the ham; the animal experienced an attack of tetanus, at the end of ten minutes; this attack was repeated, and he died fifteen minutes after the invasion of the symptoms.

Experiment 3rd. A small quantity of *Upas* was dissolved in water, and injected into the peritonæum of a dog. Twenty seconds after the injection, the animal presented all the symptoms which we have described, and expired at the end of the third attack.

Experiment 4th. Forty drops of *Upas*, dissolved in water, being injected into the pleura of an old bay horse, gave rise almost immediately to tetanus and asphyxia, and the animal died after the second attack.

Experiment 5th. A portion of small intestine was drawn out of the abdomen of a dog, two ligatures were placed at eight decimetres one from the other, and a small opening was made in the intestine, near to one of the ligatures; eight drops of *Upas*, diluted with two grammes of water, were then injected into its cavity; a third ligature was made in order to prevent the solution from escaping, and the intestine was

reduced; the edges of the wound in the abdomen were united by a single point of suture. The attacks did not begin till after the expiration of six minutes, and the animal did not die until the fifteenth of them.

When injected into the great intestine, the bladder, or vagina, the *Upas* has always produced death, with the signs of a slow and feeble absorption.

Experiment 6th. The same operation was repeated on another dog, in such a manner, as to preserve only one single vein, and one single arterial branch, given out from the mesenteric branches to the isolated portion of intestine; all the other vessels distributing blood, and receiving chyme, the nervous filaments, and the portion of the mesentery corresponding to the same part of intestine, were tied, on one part, next the curvature of the gut, and on the other, near to the centre of the mesentery, and all that was comprehended between the ligatures, was cut. Five drops of *Upas*, and two drachms of water, were injected through a small opening made in the portion of intestine; a ligature was made above the opening, to prevent the rejection of the fluid. There was no contact of the poison with the peritonæum; the intestine was replaced, and the abdomen united by suture; eleven minutes after, the attack of tetanus came on, and the animal died.

Experiment 7th. After having made an incision into the abdomen, the right extremity of the stomach was drawn out; a ligature was placed at the distance of one centimetre to the left of the pylorus, and a slight incision was made in the stomach near the ligature; about two grains of *Upas* dissolved in water, were then injected into this viscus. A second ligature was opposed to the ejection of the fluid, and the external wound was united by a single point of suture. The attack of tetanus did not take place till after the expiration of an hour.*

* In the dissection of the animals which form the subject of all these experiments, the slightest local irritation could never be discovered.

Experiment 8th. Eight drops of the solution of *Upas* were injected into the jugular vein of a vigorous horse. The animal instantly fell a prey to an attack of tetanus, which put an end to him in less than three minutes. Twelve drops of the same poison were injected into the crural artery of a dog; the effects on the spinal marrow were not sensible till seven minutes after the injection.

Experiment 9th. A small quantity of *Upas* was injected into the carotid artery; at the same moment the intellectual functions were perverted; the head was placed between the fore paws; the animal rolled himself up in a ball. These effects were soon after quieted, and the animal then fell a prey to all the symptoms which result from the action of *Upas* upon the spinal marrow.

Experiment 10th. Some Upas was introduced into the thigh of an adult and vigorous dog, and the spinal marrow was divided between the occipital, and the first cervical vertebræ, at the moment when the animal experienced a strong tetanic contraction. Not only did the paroxysm not subside, but four fresh attacks took place in the course of the fifteen minutes which succeeded.*

Experiment 11th. The spinal marrow was divided behind the occipital, and eight drops of *Upas,* mixed with four grammes of water, were injected into the pleura of the left side. The symptoms shewed themselves with the same degree of intensity, and with the same promptitude, as if the section had not taken place: they continued as long as the circulation was kept up.

Experiment 12th. Eight drops of Upas, diluted with water, were injected into the pleura of a small dog; at the same

* It is perfectly well ascertained, that the circulation goes on still, during fifteen, twenty, twenty-five minutes, in animals, whose spinal marrow has been divided, provided that they be young and vigorous:—it ceases on the contrary, almost at the instant, if they be enfeebled by age, defect of nourishment, or any other cause.

moment, a piece of whalebone was forced up the whole length of the vertebral canal: the whole of the spinal marrow followed the whalebone, when it was withdrawn. Ten minutes after the destruction of the marrow, the circulation was still very perceptible, and no contraction had taken place.

Experiment 13th. The same quantity of *Upas* was injected into the peritonæum of a dog; the moment the tetanus came on, the whalebone was forced into the vertebral canal, beginning by the first vertebræ of the neck; the tetanus ceased in the fore feet, when the whalebone arrived at the dorsal region; it continued, on the contrary, in the posterior extremities, which ceased to contract when it arrived at the caudal extremity of the vertebral canal.

Experiment 14th. Eight drops of Upas, diluted with water, were injected into the cervical portion of the vertebral canal: immediately after, a stiffness declared itself in the fore feet, which continued more than six minutes, with very strong exacerbations; the hind legs remained flexible, and as in their natural state; towards the end of the sixth minute they partook of the general stiffness; at the tenth minute, the anterior extremities were no longer stiff; the posterior continued to be so, but they shortly after relapsed.

Experiment 15th. A very vigorous shaggy dog was debilitated; afterwards the vertebral canal was cut transversely, with the spinal marrow, near the lumbar region; six drops of Upas were injected into the part of the canal, which answers to the loins and pelvis. Immediately the posterior limbs exhibited some stiffness, and presented during ten minutes the effects of the Upas: it was only at the eleventh minute, that some feeble contractions were perceived in the anterior limbs.

Experiment 16th. The Upas was applied to the lumbar portion of the marrow: the posterior limbs only experienced tetanus. A few minutes after, the poison was applied to the cervical region of the canal, and at the same moment the pectoral limbs entered into a state of contraction.

Experiment 17th. The superior part of the sciatic nerve, for about the extent of an inch, was detached; it was raised with a small plate of lead passed underneath it; a few drops of *Upas* were poured upon the nerve; it was then opened longitudinally, and the drops were insinuated into its texture. No other symptom took place than that of pain in the wounded nerve, and the cure was afterwards effected.

OF NUX VOMICA.

933. Nux Vomica is the seed of the *Strychnos Nux Vomica,* which Linnæus has ranked in the Pentandria Monogynia, and which is found at the end of the family of the *Apocyneæ* of Jussieu. The tree, which produces these seeds, grows in Ceylon, upon the coast of Coromandel, and in Malabar; it acquires a very considerable height, and its circumference is sometimes about twelve feet.* It is fond of sandy grounds.

The Nux Vomica is round, about an inch in breadth, flattened, and from two to three lines in thickness. There is towards the centre of its two surfaces a sort of umbilicus: some silky threads of an ash colour, or yellowish, or transparent, or blackish, very short, very close, and fixed obliquely between a thin and bitter pellicle, which envelopes the peri-

* Flowers in a corymbus, not very numerous, small, exhaling a disagreeable smell: calyx of five divisions, caducous: corolla a tube, border open, five divisions, of a greenish colour, four or five stamina, the filaments of which are of a pale green, and the anthera of an oblong form: style single, which rises above the stamina, and bears a stigma not very thick: berry single, or multiplied, round, without down, at first of a green colour, then of a golden yellow; is of the size of an orange, having one single cell containing the seed: roots thick, bitter, and covered with a yellowish bark: bark of an ash colour, blackish, and knotty, which afterwards grows red, and has a bitter taste: leaves broad and entire, opposite, inserted obliquely; their disk flat, oblong, broadish in the middle, presenting five ribs; they are of a deeper green colour on their inferior surface.

sperm, cover the whole surface of this seed. The disposition of these silky hairs is such that they are all directed from the centre to the circumference, or those of one of the surfaces appear to cross those of the other. On the circumference of the seed is observed one point somewhat more projecting than the rest: it is that from which the young plant would proceed. The perisperm is of a brown yellow colour, or of a white verging towards green, and hard; it presents in its interior, when opened, a large cavity intended to lodge the embryo during its first developement: the sides of this cavity are in contact, and are of the thickness of about a line throughout.

The *Strychnos Colubrina* furnishes also the Nux Vomica.

ANALYSIS OF NUX VOMICA BY *M. CHEVREUL.*

Acidulous malate of lime, gum, vegeto-animal matter, bitter matter, fixed oil, colouring matter, which was yellow, and probably starch, which could not be directly extracted on account of its desiccation; earthy and alkaline salts, woody hairs, and wax, which appears to preserve the perisperm from humidity.

ACTION OF NUX VOMICA ON THE ANIMAL ECONOMY.

Experiment 1st. A dog of middle size was made to swallow somewhat less than half a drachm of Nux Vomica mixed with honey. Three quarters of an hour after, the animal had convulsive movements in the posterior limbs, which were separated from one another, and pushed forward so that the dog rested upon his heels. All at once he rose up, stretched out strongly his limbs, and separated them: he made several bounds, as if all of one piece; the neck and back were in

a state of tetanic stiffness, and were curved backwards; the tail was brought under the belly: he fell down again afterwards on the feet, touching the ground only with the extremity of his toes. A short time after, he fell down on the side; tremblings, tail extended straight; at last relaxation of all the muscles. The animal had a second attack, which began by convulsive movements of the face, mobility of the eyelids, whilst the eyes, which were immovable from the tetanic contraction of their muscles, were starting out of their orbits. Shortly after, general tetanic stiffness. He might be raised up all in one piece; general trembling; the tongue was projected out of the mouth; it was of a violet colour, as well as also the lips; the respiration was suspended by the tetanic contraction of the muscles of the thorax; general relaxation. In the attacks which preceded death, respiration was carried on during the paroxysm, and then the tongue and lips returned to their natural colour. He expired at the fifteenth attack, twenty-eight minutes after the invasion of the symptoms, and preserved all along the use of his senses. The intensity of the symptoms might be increased, and even the attacks brought on by touching him, threatening him, or making a noise; but these means did not excite the convulsive movements of the face. A few moments before death, the breathing became somewhat noisy, as if the animal had the rattles.

Dissection. There was no vestige of inflammation in the digestive canal, nor in the respiratory organs, nor in the brain; the cerebral sinuses appeared somewhat more distended than in their natural state; almost the whole of the Nux Vomica was contained in the stomach; the heart contained blood which was blackish and somewhat coagulated, especially in the right auricle.

This experiment, repeated upon another dog, furnished similar results, except that the animal, who was weaker, was not affected till an hour after the ingestion of the Nux

Vomica, and that he lived an hour, dating from the moment of the attack; in general also the symptoms were more decided.

Another small dog, who swallowed twelve grains of Nux Vomica in lumps, experienced symptoms similar to the preceding, half an hour after the ingestion, and died at the end of twenty-five minutes.

Bonetus has detailed experiments made upon young dogs, the results of which bear a great relation to those we have just described. (*Theophili Boneti Sepulchretum*, tom. iii. p. 497. *Lugduni*, 1700.)

Experiment 2nd. A frog of middle size was made to take three grains of Nux Vomica rasped, and mixed with honey. A quarter of an hour after, the breathing was accelerated, and the belly swelled; the trunk was straightened whilst the eyes were sunk in; the feet were in their natural state, and the animal made a slight noise. He remained quiet during a few minutes, then had three other attacks, separated by a like interval of repose, and distinguished by the same phenomena, but more decided. *Fifth attack.* Convulsive movements, and considerable stiffness of the limbs and trunk; the animal might be turned about all in one piece: the duration of the movement of flexion was extremely short compared to that of the extension: touching, agitation, shaking of the floor, produced these effects. It was impossible to ascertain the state of vision, on account of the continual movements of the eyelids. The stiffness diminished in intensity; the action of the thoracic limbs was extinct, whilst the paws were still exercising their movements.

Dissection. The mouth and œsophagus were filled with thick mucosities; the major part of the boluses ingested were stopped at the superior orifice of the stomach; there was also a small quantity in this viscus; the portions of the œsophagus and of the stomach upon which the poison had been applied, presented a red colour; the membrane which envelopes the

cerebellum, and the first part of the spinal marrow, exhibited veins somewhat more distended than in their natural state.*

Experiment 3rd. *M. Lesant,* an apothecary at Nantes, gave to dogs and cats of different degrees of strength, the watery extract of Nux Vomica in the dose of from one grain to four; the animals have constantly died within less than ten minutes, when the poison has been administered to them in a watery solution, and at the end of three or four hours only, when they have taken it in the form of pills, and inclosed in meat. A very strong dog, after having taken four grains of this extract in meat, and after having experienced horrible convulsions during an hour, was capable of being recalled to life. He was made to take a large quantity of oil and vinegar. *M. Lesant,* who was so good as to communicate to me this note, is of opinion, that the animal did not owe his recovery to these fluids.

Experiment 4th. Twelve grains of the watery extract of Nux Vomica were injected into the pleura of a dog. At the end of one minute, the animal had an attack of tetanus; the section of the spinal marrow below the occipital vertebra did not put an end to the paroxysms; he had two others before he died.

Experiment 5th. Six grains of the same extract, dried on to the end of a small pointed piece of wood, were forced into the muscles of a dog's thigh. Tetanus came on at the end of half an hour; the animal had more than twenty paroxysms, and died forty minutes after the operation.†

* These experiments have been made by *Dr. Desportes (Vide Dissertation Inaugurale soutenne à la Faculté de Médecine de Paris,* l'an 1808.) They agree with those which *M. M. Magendie* and *Delile* have since made on the same subject, and which I have repeated with great care. *Wepfer,* in his work on Water Hemlock, renders an account (p. 134, et. sequent.) of the results which he has obtained in administering Nux Vomica to dogs and to cats; he compares the symptoms to paroxysms of epilepsy, and he affirms that there is a suspension of vision, hearing, and touch.

† *M. M. Magendie* and *Delile,* from whom we have borrowed these facts,

Experiment 6th. A small piece of wood was coated with a grain and a half of resinous extract of Nux Vomica, and the thigh of a dog was pricked with it; tetanus came on at the end of seven minutes, and the animal died five minutes after the attack.

Experiment 7th. Another dog, and some rabbits, which were wounded with the same poison, died very quickly of tetanus and asphyxia.

Experiment 8th. An ounce of a decoction prepared with ten grains of Nux Vomica, and twenty-four ounces of water reduced to about eight ounces, was injected into the pleura of a young dog. The injection was scarcely terminated when all the symptoms above described took place, and the animal died in less than one minute. The pleura presented no trace of inflammation.

Experiment 9th. Two ounces of the same decoction were injected into the peritonæum of a dog of middle size. At the end of one minute, invasion of the symptoms; the animal had two paroxysms less violent than those of the preceding experiment, and died one minute after. The peritonæum and the other organs were sound.

Experiment 10th. A little more than half an ounce of the same decoction was injected into the jugular vein of a great dog. A few moments after, the animal had some convulsive movements, and at intervals, a rigidity similar to that of tetanus: the crural artery was rendered extremely tense; its pulsations very slow. The animal died in a very short time. There was no alteration in the vessels.

Experiment 11th. About three ounces of the same fluid were injected into the cellular texture of the back of a great dog. At the end of five minutes, the animal began to separate the posterior limbs from one another; their movements were

as well as the two which follow, have observed that the watery extract of Nux Vomica was not hurtful when introduced in a fluid state into wounds, and that it only acted when forced in between the muscles.

become stiff and difficult, the tail was drawn under the belly; he appeared to be extremely uneasy: shortly after, invasion of rigidity similar to that of tetanus, accompanied by the nervous symptoms before described. He died at the end of the second paroxysm. The cellular texture, which was infiltrated by the fluid injected, presented no redness.

Experiment 12th. A small dog was made to take a bolus made with crumb of bread and two grains of the bitter principle of Nux Vomica, united with a little oil and sugar. At the end of seven minutes, the animal contracted all his external muscles, made a leap forward, which might be compared to the action of a spring, and fell down on the side, the head being strongly reversed backwards, his tail elevated, the paws stretched out; the breathing was suspended, and consequently the tongue and lips were of a violet colour; general trembling; the organs of sense performed their functions; emission of urine. To this state succeeded a relaxation, during which the breast was a little elevated and depressed. Shortly after, invasion of the second and last paroxysm with the same symptoms, but less feeble. Towards the end of this paroxysm, there were some convulsive movements of the lips, and a general relaxation; the animal made one or two deep inspirations and died. The two paroxysms only endured one minute.

Dissection. The tongue and lips were slightly tinged violet; no lesion of the digestive canal; the bladder filled with urine; the left cavities of the heart, the two *venæ cavæ*, and the jugulars, were strongly distended with blood.

Experiment 13th. Eighteen grains of the same bitter principle were dissolved in half an ounce of water, and injected into the bladder of a dog of middle size: a ligature was applied to the penis, to prevent the escape of the fluid. Ten minutes after, the animal fell into a very strong paroxysm of tetanus. This attack was repeated several times, and the animal expired twenty minutes after the injection. The brain, the spinal marrow, and the membranes which envelope them

were sound: the bladder and the digestive canal presented no alteration; the interior of the veins was not inflamed; the cavities of the heart and the venæ cavæ were distended with blood.

Experiment 14th. A small dog was made to swallow two grains of the oil of Nux Vomica (obtained by alcohol), enveloped in crumb of bread. At the end of two hours and a quarter, a separation of the legs took place, with stiffness of the movements at intervals; three hours after, he was found dead. There was no alteration in the organs.

Experiment 15th. Three nuts of this plant were given to a goat of one year old; one part was chewed by the animal, which excited considerable salivation; he had a frequent desire to pass urine, and several convulsive bleatings. The next day, the animal was recovered; he was made to take six drachms of the same substance, and no accident succeeded. He ate afterwards at several different times, some balls prepared with this poison, and was not at all incommoded by it. He was killed four days after the first ingestion, and a few pieces of the Nux Vomica were found in the stomach untouched.

Experiment 16th. *M. Desportes* gives the following detail of the action of Nux Vomica upon a fowl: "from the fourth to the twenty-second of May, a black fowl, a year old, in good health, and whose crest and caruncles were of a bright red colour, was made to take every day, Nux Vomica in small pieces. The experiment was begun with one grain, and there were added successively each day, to the evening dose, the quantities following; 1st. The first four days, one grain. 2nd. The four following days, four grains. 3rd. The four days which came after, the quantity of eight grains. 4th. During four days more, that of twelve grains. 5th. Lastly, sixteen grains in the four last days. For the rest, the following are the days and quantities corresponding: 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23rd, May; 1, 2, 3, 4, 8, 12, 16, 20, 28, 36, 44, 52, 64, 76, 88,

100, 116, 132, 148, 164 grains. So that she took in the whole 1,114 grains of Nux Vomica in substance, that is to say, ninety-two times the dose necessary for killing a dog. The animal was always carefully fed.

" Now the following are the effects produced:—from the 4th to the 16th of May, no apparent change in her situation; from the 16th to the 18th, diminution of appetite; the fowl pecks on the side of the grain, two or three times before she is able to seize it; excrements of a deep green colour. On the 19th, she no longer ate, the red colour of the crest less bright. The 20th, and the 21st, the same symptoms; besides diminution and slowness of motions, stiffness of the limbs. 22nd. Ardent thirst, movements extremely difficult, slight stiffness of the limbs, impossibility of keeping upon her feet; a kind of drowsiness, from which she is easily roused, and during which the feathers are somewhat bristled; Diarrhœa; the crop is felt to be very much distended by the substance, which she has been obliged to take. The 23rd, the same symptoms, but more decided. On that day, foreseeing that the extreme distention of the crop would not permit me to give the next day a fresh dose, and beside being pressed for time, I decided, about three hours after she had swallowed the 164 grains of Nux Vomica, to make her take somewhat less than half an ounce of water, holding in solution about four grains of the bitter principle, united with sugar and a little oil. Scarcely had a minute elapsed when the fowl, who was in the act of incubation, rose up all at once with the wings extended, the tail expanded, all the feathers bristled, the feet in a state of strong distention, the claws only touching the ground; the eyes fixed, the beak open: she fell almost immediately upon the back; general trembling, the wings folded and pressed strongly against the body, continual movements of extension and flexion of the legs, the neck drawn down upon the back with a tetanic stiffness, the eyelids opening and shutting alternately, which occurred so frequently, that I could not

assure myself whether she could see. Three cries, but feeble; the beak at one time open, another time shut. The breathing at first suspended, with a livid discolouration of the crest, and of the caruncles: lastly, relaxation general and very short, with a hurried respiration. Return of the convulsions, with the breathing still hurried; successive decreasing of these symptoms; death a few minutes after the invasion.

"*Examination of the body.* The brain, trachea, lungs, heart, and vessels exhibited nothing particular, as likewise the œsophagus. The crop was greatly distended and filled with pieces of the Nux Vomica no ways altered, some grains of corn, and a small quantity of fluid; the whole of this mass had a sour smell. The membranous stomach and the gizzard contained portions of Nux Vomica very greatly altered; the others only beginning to be so by the digestive action of these organs; the intestine contained a chymous matter; each cœcum and the colon, a greenish matter. The mucous membrane of all these parts, as well as that of the *Oviduct*, presented no trace of inflammation. No alteration in the colour of the bile. The animal was become somewhat lean.

"The whole of the digestive apparatus was carefully separated from the body, and was given to a young spaniel of four months, who did not appear to suffer any thing from it; he preserved on the contrary, all his gaiety and love of play. On the evening of the third day, some person threw him the intestines, and he died in the night. He was opened the next day, and there were found in the stomach, all these parts nearly entire. It appears that he had swallowed them almost without tearing them. A few fragments of the Nux Vomica were found; the rest of the alimentary canal of the dog, was empty excepting the last portion.

Observations.

1st. *Hoffmann* reports that a young girl ten years of age, labouring under an obstinate quartan fever, took at two doses,

fifteen grains of Nux Vomica. She died in a short time; after having experienced extreme anxieties, and having made some efforts to vomit. (*Med. System*, tom. iv. cap. viii.) My pupil *M. Bell*, a young English physician, assured me that a similar accident had lately taken place in England.

2nd. A person swallowed in the morning, a scruple of Nux Vomica in powder, and drank afterwards a few glasses of cold water, in order to diminish the bitterness occasioned by this substance. Half an hour after, he appeared to be drunk; his limbs, and especially the knees, were stiff and tense; his walk was staggering, and he was afraid of falling. He took some food, and the symptoms disappeared without his having had either stools or vomiting. (*Veckoskrift for Lakare.*)

The same author reports that a woman had convulsive movements, and a cardialgia of long duration, after having taken Nux Vomica.

3rd. The administration of Nux Vomica, and of the root of Gentian to a woman affected with intermitting fever, was followed by dangerous convulsions, cold, and stupor of almost every part of the body. (Scutter, *Diss.* § 11.)

OF THE BEAN OF *SAINT IGNATIUS.*

934. This seed appears still to belong to the genus *Strychnos*, at least the tree which produces the fruits in which it is contained presents, in the flowers and leaves, the same parts, and the same disposition as the *Strychnos Nux Vomica.* Some botanists make a separate genus of it, which they call *Ignatia*, and a species of which, the *Amara*, would furnish the bean, which we are speaking of. Be it as it may, this seed is irregular, more or less angular, hard, having a kernel, and extremely bitter.

ACTION OF THE BEAN OF *SAINT IGNATIUS* ON THE ANIMAL ECONOMY.

Experiment 1st. A dog of middle size was made to swallow half a drachm of the bean of *Saint Ignatius*, rasped and mixed with butter. At the end of five minutes, he began to pant. Fifteen minutes after, he straightened himself out from time to time in a convulsive manner. The poison had scarcely been ingested half an hour, when the animal was carried rapidly forward, and fell down in a paroxysm of tetanus, first upon the chest, afterwards upon the side; the limbs and the neck were in a state of tension, the mouth of a violet colour; he preserved the use of his intellectual faculties; had an emission of urine; in fine, he had ten attacks, several of which had been provoked by noise or touching him, and he died in a state of asphyxia, at the end of twenty minutes.

Another dog, who had taken only ten grains of this poison, died at the fourth attack, three hours after its ingestion.

Six grains of this seed have proved sufficient to kill a dog in half an hour: this animal had drank water after having swallowed the poison.

Experiment 2nd. The extract of the bean of *Saint Ignatius*, injected into the veins, the pleura, the peritonæum, or applied externally, acts like the Upas, or extract of Nux Vomica.

Observations.

Camelli reports in the Philosophical Transactions of London, tom. xxi. p. 88. ann. 1699, that a dyspeptic man, who was attacked by vomiting, and Diarrhœa, took a scruple of the bean of *Saint Ignatius*, which occasioned him itchings and terrible convulsive pinchings; he was not able to stand; his jaws were locked; the muscles of the face performed movements, which might be compared in a certain degree to those made in laughing.

935. We do not take notice here of the *Strychnos Potatorum,* nor of another species of *Strychnos* known under the name of *Pomme de Vontai,* because the juice and seeds of this plant do not possess any poisonous properties, according to the experiments of *M. M. Magendie* and *Delile (Dissertation Inaugurale de M. Delile, soutenue à la Faculté de Médecine de Paris, 6 Juillet,* 1808.

CONCLUSIONS ON THE EFFECTS OF THE *STRYCHNOS.*

1st. The Upas-tiéuté, Nux Vomica, and the bean of *Saint Ignatius* are poisons extremely energetic for a very great number of animals, and for the human species.

2nd. They ought to be regarded as substances producing excitement on the spinal marrow, on which they act, by producing tetanus, immobility of the thorax, and consequently asphyxia, of which the animals die.

3rd. With whatever part of the surface of the body, they may be brought in contact in a suitable manner, they are absorbed, carried into the circulation, and the absorption appears to be effected through the medium of the veins, as *M. Magendie* has first observed. (*Vide* his excellent *Memoire* on *Absorption.*)

4th. Their action is extremely prompt, when injected into the pleura, peritonæum, or jugular vein: it is less so when applied externally, or when injected into the arteries, at a distance from the heart. Its effects are still longer in making their appearance, when applied to the mucous surfaces.

5th. Their action is null, when the spinal marrow is removed by means of a piece of whalebone.

6th. The watery extracts of Nux Vomica, and of the bean of *Saint Ignatius,* are more energetic than the powders of these seeds; but they are less so than their resinous extracts.

7th. None of these poisons produce inflammation of the textures to which they are applied.

OF THE *ANGUSTURA PSEUDO-FERRUGINÆA.*

936. There is found abundantly in commerce, a particular bark, which the druggists designate by the name of fine *Angustura,* and which differs essentially from it. We are of opinion that it is so much the more important to make known its characters, as it ought to be ranked amongst the most energetic poisons in the vegetable kingdom ; whilst the real Angustura might be taken in a strong dose without inconvenience. *M. Planche,* a distinguished apothecary and chymist of this capital, who has written a very excellent work on the natural history of these barks, has presented to M. M. *Pessieu* and *Bonpland,* the species which we are here treating of, and they have declared that they know not to what vegetable it could belong.*

The learned traveller *M. de Humboldt,* who has been so good as to communicate to me several particulars relating to the poisons of America, has told me that he did not believe that the bark of the *Angustura Pseudo-Ferruginæa* belonged to a tree of the same species as the real Angustura, which he has called *Bomplandia Trifoliata.*

Characters of the bark. The barks of this species are in general rolled up, of a yellowish grey colour on the inside. Some of them have the epidermis scattered over with whitish excrescences ; others are covered with a matter which has the appearance of rust of iron, and which possesses certain properties of it ; other barks are more or less polished, sometimes very rugged, and scattered over with spots of various colours ; these latter are, in general, more thick, and more bulky than the others ; and although they differ in appearance, they possess the same chemical properties ; they are only

* *Notice Chimique sur les Angustures du Commerce,* read before the Society of Medicine of Paris, the 2nd June, 1807, by L. A. Planche.

somewhat more ferruginous. The powder of this false Angustura is of a gray colour, similar to that of ipecacuanha, and of a smell resembling that root. It is so bitter, that a great many persons cannot taste it without experiencing nausea.

937. If this powder be macerated with water in the same proportions, and during the same time as the real Angustura, a liquor will be obtained, which, when filtered, has a pale straw colour, that is not perceptibly altered by the contact of the atmosphere, of an insipid smell, and a bitterness, which may be compared to the powdered bark, furnishing a black gray precipitate with the sulphate of iron, and, with the nitrate of silver, a white precipitate, which, in the course of five or six minutes, passes wholly into a black. The sulphate of copper forms with it a precipitate less coloured and more copious than with the true Angustura; it is not rendered turbid by the solution of glue.

938. Water sharpened with muriatic acid, and agitated with the powder of this false Angustura, puts on a beautiful colour of a clear green, if an alkaline prussiate be poured upon it, and a short time afterwards it throws down prussian blue. It is necessary to remark that a very beautiful prussian blue may be obtained at the moment, if the yellow powder which covers the bark, be treated by the muriatic acid; which proves evidently that this matter is of a ferruginous nature. This singular phenomenon is not observed with the real Angustura bark.

939. The decoction of the ferruginous Angustura is higher coloured than its water of maceration; so long as it is hot, it is transparent, and becomes turbid by cooling, in which respect it resembles the Cinchonas. The metallic salts before mentioned, act in the same manner, within a few shades of colour which are not worth taking into consideration, upon the water of maceration, and upon the decoction, of the false ferruginous Angustura. (PLANCHE, p. 7.)

ACTION OF THE *ANGUSTURA PSEUDO-FERRUGINÆA* ON THE ANIMAL ECONOMY.

Experiment 1st. A dog of middle size was made to swallow eight grains of the bark of Augustura Ferruginæa, reduced to a fine powder. At the end of seven minutes, the muscles of the extremities were affected by a convulsive movement; the eyes, which were hagard, shed abundance of tears; the animal walked towards the corners of the laboratory, drawing the feet close to one another; he panted continually; twelve minutes after the ingestion of the poison, the agitation had increased; the head was straightened from time to time in a line with the vertebral column; he bent the posterior legs; the head and trunk were reflected backwards; he made twelve or fourteen steps forwards, and so much at random, that he struck his face against a tub, and fell down immediately upon the side; his eyes were then starting out of his head, and motionless, the conjunctiva was red, all the muscles of the trunk and extremity strongly contracted, the ears bent backwards, the organs of sense insensible to external impressions; the muscles of the face were not agitated by any convulsive movement, and respiration was no longer carried on. This attack lasted five minutes, but the organs of sense preserved their insensibility only during the first minute, for in the middle and towards the end of the paroxysm, the approach of a stick was sufficient to increase the stiffness and all the other symptoms. At the end of this attack, the animal attempted to get up; the mouth was wide open, and the breathing very panting. Ten minutes after, a fresh attack, which lasted four minutes. At last he expired, an hour and a quarter after the introduction of the poisonous substance into the stomach, at the end of the third attack. He was opened twenty minutes after. The heart was no longer beating; the blood contained in its cavities was blackish, partly fluid, partly coagulated; the lungs,

which were distended with blood of the same colour, were somewhat less crepitating than in their natural state; the stomach contained a great quantity of food, for no vomiting had taken place; the digestive canal was sound.

Experiment 2nd. At three quarters past eight, a dog of middle size was made to swallow three grains and a half of the same powder. A quarter of an hour after, he was made to drink a great quantity of water. At six minutes after nine, the animal experienced a trembling in the legs; he was touched, and instantly had an attack of tetanus, which lasted only a minute; he rose up and did not appear ill. At eleven minutes after nine, he was again pushed about; he immediately fell down in a state of remarkable rigidity, which did not cease till the expiration of two minutes; he again made efforts to rise, and ran rapidly about the laboratory; he stopped all at once, pressing strongly his feet against the ground: he had at that moment the trunk excessively arched, and his head touched the ground. At one he had suffered no more attacks, and appeared to be no longer under the influence of the poison. He was made to take six grains of the same powder. Five minutes after, he had an attack which lasted two minutes, and died. In the different paroxysms under which this animal laboured, the tail was sometimes curved upwards, sometimes downwards. He was immediately opened. The blood contained in the ventricles of the heart was black and fluid; the lungs were very little altered; the stomach contained the powder of the Angustura dispersed among some food; there was no lesion in the digestive canal.

Experiment 3rd. A wound made in the inside of the thigh of a great dog, was sprinkled over with nine grains of the same powder. On the third day, the animal not having experienced any thing, thirty-six grains of the same poison were applied to the cellular texture of the other thigh. At the end of seven hours, the animal began to feel the effects of it; he had an attack of tetanus similar to that which we described

in experiment 1st. This attack lasted ten minutes, and he died.

The Dissection took place the next morning. The internal organs presented no alteration; the first wound was red, infiltrated, without any appearance of eschar.

Experiment 4th. A small robust dog was made to swallow two grains and a half of the watery extract of *Angustura Ferruginæa*, which had produced no effect at the end of a quarter of an hour; he was then made to take six grains. A few moments after, the animal experienced a general trembling; he sat down on his hind legs; his body became arched, and he fell down upon the side; his muscles were excessively rigid; there was no agitation of the legs; the pupils were dilated, the organs of sense insensible to external impressions, and the eyelids in a state of great mobility; towards the end of the paroxysm, which lasted two minutes and a half, he recovered the use of his senses; he rose up and walked about the laboratory. Four minutes after, some one sought to frighten him; instantly he fell down again, the head was reflected upon the back, the breathing was suspended. At the end of a minute he opened his mouth and panted considerably. Two minutes after, he had a third attack, during which the organs of sense appeared to be insensible. The end of this paroxysm was marked by profound inspirations and by convulsive movements of the muscles of the face. He died three minutes after. He was opened immediately, the cavities of the heart were no longer contracting, the blood which they contained was black and fluid; the lungs were but little crepitating, and presented an increased degree of density in their texture; the digestive canal was sound.

Experiment 5th. Four grains of the same extract were brought in contact with the cellular texture of a small dog. At the end of ten minutes, the animal experienced general tremblings; his walk became uncertain, his eyes hagard, and three minutes after, he fell into a violent paroxysm. He ex-

perienced four during the three hours that he lived. The body was not opened.

Experiment 6th. Thirty-six grains of the same extract were applied to the cellular texture of the inside of the thigh of a small dog. Five minutes after, trembling of the posterior limbs, and at the end of another minute, a very strong attack, in which the extremities were agitated and stiff; the muscles of the face, of the eyelids, and of the jaws, convulsed; the body was not very much arched, the organs of sense were free, the pupils somewhat dilated, respiration almost suspended. This fit lasted nearly five minutes; the limbs relaxed; the animal made three deep inspirations, and died eleven minutes after the operation. The dissection took place immediately. The heart was no longer beating; the blood was fluid and black in all the cavities of this organ; the lungs, which were somewhat more dense than ordinary, were gorged with blackish blood.

Experiment 7th. Three grains and a half of the watery extract of Angustura, dissolved in half an ounce of water, were injected into the jugular vein of a dog. The animal experienced immediately the symptoms above pointed out, and he expired five minutes after the injection. He was opened at the same instant, and the heart was found distended by a very considerable quantity of blood, which was coagulated.

Experiment 8th. At seven in the morning, a robust dog was made to swallow a grain and a half of the *bitter yellow matter* separated from this species of Angustura. Five minutes after, the animal experienced all the symptoms which characterize the paroxysms of which we have just been speaking, and died at the expiration of fifteen minutes, at the end of the twelfth attack. This bitter matter had been prepared by *M. Planche,* who employed the following process:

"The bark of Ferruginous Angustura was exhausted by several successive macerations in alcohol, at 38°. The liquor, when filtered, was distilled in a glass retort; there were drawn

off, by distillation, the seven-eighths of pure alcohol; the residue, being dried in a water-bath, was treated by boiling distilled water; it is the portion dissolved by this fluid, and concentrated to the consistence of an extract, which constitutes the bitter yellow matter. In order to observe well its colour, it is necessary to extend it in thin layers. This matter is extremely soluble in cold water; it is of an insupportable bitterness; it is possible that it is only a combination of the bitter principle with the yellow matter, for a small quantity of the yellow matter without any sensible bitterness, but only styptic, may be separated (although, indeed, in a very minute quantity) by the means of sulphuric æther. In the surplus, the bitter principle of this extract is found in the most concentrated form possible."

940. The preceding facts permit us to conclude, 1st. That the powder of *Angustura Pseudo-ferruginæa*, and its different preparations, acts like Nux Vomica and the other Strychnos;* 2nd. That the yellow matter appears to be the most active part.

M. Professor *Emmert*, whose medical knowledge is so extensive, has been so good as to communicate to me the results of an important operation performed by him at Bonne, on the bark of a species of Angustura, to which *Rambach* has first given, in 1804, the name of *Angustura Virosa*. This bark appears to be the same as that of which we have just given the history.

* There are many practitioners, who are of opinion that Nux Vomica, Upas, bean of Saint Ignatius, and the false Angustura, act upon the brain as well as upon the spinal marrow. They bring forward in support of their opinion, cases where the administration of Nux Vomica was followed with delirium and the loss of the intellectual faculties. It may be remembered that we have already said that such was the opinion of Wepfer. We have frequently remarked that animals submitted to the action of either of these four substances, lost the use of their senses; but it was only a temporary effect, and always when the paroxysm was extremely violent. Consequently we are of opinion that their principal action takes place upon the vertebral column.

The following are the principal results obtained by *M. Emmert.* 1st. The *Angustura Virosa* is a violent poison for the human species, the mammifera in general, birds, fishes, and reptiles, when it is applied upon the mucous membranes, wounds, the pleura, the peritonæum, and upon all the parts which contain a great quantity of blood-vessels: it is on the contrary, inert, or little active, when brought in contact with the nerves, the tendons, or the epidermis not wounded.

2ndly. The effects of this poison may be put a stop to completely when the circulation in the part to which it has been employed is stopped: the phenomena of poison take place, on the contrary, even when the nerves of the limb on which it had been applied are cut. 3rd. Vinegar, oil of turpentine, and coffee, do not oppose the effects of Angustura; coffee rather accelerates them, oil of turpentine appears to diminish them a little. 4th. After death, the involuntary muscles preserve their irritability, whilst the voluntary muscles no longer shew any sign of it. 5th. A child died after having taken by mistake, the decoction of this bark: he preserved the use of his intellectual faculties, and earnestly begged that he might not be touched, for he experienced terrible cramps after each time of handling him; he had a copious perspiration, but did not vomit." (Lettre de *M. Emmert* du mois de Janvier.)

END OF PART I. VOL. II.

J. M'Creery, Printer,
Black-Horse-Court, London.

A

GENERAL SYSTEM

OF

TOXICOLOGY.

Continuation of Class V. *and of the Narcotico-Acrid Poisons.*

OF THE UPAS-ANTIAR.

941. The Antiar is a tree of a new genus, and the Upas which it furnishes, is the juice which flows from the tree. This juice is milky, bitter, and somewhat yellow. It produces no inconvenience when slightly applied to the tongue, or dropped on the skin; introduced however into wounds, it destroys by an extremely painful death both men and animals. The Indians employ it in their wars. *M. M. Magendie* and *Delile*, on the 28th of August, 1809, read to the Institute a paper, in which they explained the effects of this subtle poison. We shall here report the experiments tried by them, and which we have repeated.

ACTION OF THE *UPAS-ANTIAR* ON THE ANIMAL ECONOMY.

Experiment 1st. When six or eight drops of the fluid

juice of the Antiar are poured into an incision made with a scalpel in the thigh of a dog or cat, near the groin, or a small piece of wood is introduced, covered with a grain, or even half a grain, of the Antiar dried, the animal does not appear to suffer any thing for eight or ten minutes; he then vomits twice or thrice, some yellowish matter, of a bilious appearance; he sometimes passes several stools; seldom moves from his place, lies down, and rises up again from time to time. The vomitings, which had ceased, return again after five or six minutes; the respiration becomes noisy, and is interrupted by hiccups and sobs; the muscles of the abdomen and thorax contract; a yellowish and viscid froth covers the edge of the jaws; all at once, the animal utters several loud cries; his head bends back, he falls down on the side, stretches out his limbs, and agitates them in a very irregular manner; the muscles of the face are affected with twitchings; the animal makes irregular leaps, and sometimes strikes himself against some of the surrounding objects; the breathing is executed by starts; a kind of rattling in the throat comes on, which shortly after ceases with life. On opening the body immediately after death, the heart is found to contain arterial blood of a vermillion colour; there is no lesion of the brain; the wound preserves the colour and bitterness of the poison.

Experiment 2nd. When dogs are made to swallow four grains of Antiar, it is observed, that they begin to vomit at the expiration of an hour; the vomitings continue for three or four hours, with long intervals of repose; they pass many stools, and death takes place at the end of eight, ten, or twelve hours.

Experiment 3rd. More than twenty drops of Antiar may be poured upon the sciatic nerve, isolated from the surrounding parts, during the space of an hour, without producing any effect on the animal.

Experiment 4th. If this juice be injected into the jugular vein of dogs and horses, these animals die a few minutes after,

and the symptoms which precede dissolution, are the same as those described in the first experiment. Death takes place somewhat later if the Antiar has been injected into the pleura, or into one of the veins of the mesentery; but in every instance are observed vomitings, purging, cries, and convulsions.

Experiment 5th. When a few drops of Antiar diluted with water, are injected into one of the carotids of a dog, the animal utters a cry at the moment; he experiences no vomiting; the head is twisted; the occiput is bent back upon the floor; the neck and trunk are curved into the shape of an S; the paws grow stiff, and are occasionally agitated. Death takes place in less than five minutes. The injection of the Antiar into the substance of the brain, produces the same effects as the injection into the carotid.

942. It results from these facts,

1st. That the Antiar is extremely poisonous when injected into the carotid artery, the substance of the brain, or the jugular vein; that it is less so injected into the pleura; still less when applied to the cellular texture; and much less still when taken into the stomach;

2nd. That it is absorbed, carried into the circulation, and acts upon the brain and spinal marrow; which is proved by the loss of the senses, by the acute cries, by the turning back or contortion which the head experiences, and by the twitching of the muscles of the face;

3rd. That it acts also as an emetic.

M. Brodie is of opinion, that the Upas-Antiar acts on the heart, which it renders insensible to the action of the blood. He founds his opinion on this circumstance, that very shortly after the application of the Upas, the contractions of the heart are irregular, intermittent, then become weak, and cease immediately after death: this organ is then found distended by a great quantity of blood. (*Philosophical Transactions*, p. 196, *year* 1811.)

Mr. Emmert has likewise made the same observations on the state of the heart of animals poisoned by the Antiar.

OF THE *TICUNAS*, OR AMERICAN POISON.

943. *De la Condamine* informs us, in an abridged account of a journey made through the interior of South America, "that the Ticunas is an extract, obtained by means of fire, from the juice of different plants, and particularly of certain climbing shrubs. They assured me, that there enter more than thirty different kinds of plants and roots into the composition of this poison. The Indians always compound it precisely in the same manner, and follow to the letter the process received from their forefathers, as scrupulously as the apothecaries amongst us, proceed to the solemn preparation of the Theriaca."*

944. This poison dissolves extremely well in water, and in the mineral and vegetable acids: it produces no effervescence with acids, or with alkalies; it neither turns the juice of radishes red nor green; it dries without cracking.

ACTION OF TICUNAS ON THE ANIMAL ECONOMY.

945. It results from the experiments made by Fontana on this poison,

1st. That its smell, in the dried state, is altogether harmless;

2nd. That the same may be affirmed of the vapours which it exhales when placed on burning charcoal, whether inhaled by the nose, or by the lungs; and that consequently what is reported by La Condamine, that women condemned to death, are killed by means of these vapours, is false;

3rd. That it produces no action when applied to the eyes;

* *Mémoires de l'Académie des Sciences*, ann. 1745, p. 490.

4th. That it is poisonous when taken internally; but that a sensible quantity is necessary to kill even a small animal;

5th. That when applied to the skin scarcely scratched, it is capable of producing death, although not always, nor under all circumstances; the larger animals resist more easily the action of this poison; and when even the weakest escape death, they find themselves in a short time in as good health as before;

6th. That about the hundredth part of a grain of Ticunas is required to kill a small animal, and that it is necessary that the poison be dissolved, in order to produce death, or any sensible derangement in the animal economy;

7th. That the poisoned wounds of the muscles are more fatal than those of the skin, of the ears, and of the combs of fowls;

8th. That the arrows covered with dried Ticunas, are more dangerous and fatal, than the poison dissolved in water, and simply applied to the wounded part;

9th. That the poison of the arrows is more active if they be previously soaked in hot water; their activity is still more increased, if they be dipped in the poison boiled in water, to the consistence of a julap. The symptoms which this poison produces the most commonly, are convulsions, faintings, total deprivation of strength and motion, diminution, or total loss of feeling. It is frequently observed, that the animal, which was at first extremely lively, is deprived a moment after of motion and feeling, and on the point of death. If he does not die, in the course of a few minutes he is as well as before, and does not appear to have suffered any inconvenience, although he has been in a state of lethargy, sometimes for several hours, without giving any certain or manifest sign of life.

10th. That a determinate time is necessary for the American poison to communicate itself to the animal; that this time is much more considerable than that which is required by the

venom of the viper (vide *Venom of the Viper)* to communicate itself; that the effects of the American poison upon animals are more indeterminate and variable; and, lastly, that either of them may be cured by cutting off the parts, when they can be removed without endangering life, provided that the amputation be made in time;

11th. That it instantly destroys life, when introduced into the jugular vein; but does not coagulate the blood like the venom of the viper;

12th. That it produces no sensible change on the economy of the living animal, when applied to the nerves, whether entire, cut, or wounded, provided that they be isolated from the muscles, and other surrounding parts;

13th. That the muscles of animals killed by this poison, are of a paler colour than before; that the veins in the vicinity of the heart are more swelled, and the blood somewhat darker; that the heart, the auricles, and the abdominal viscera, present no alteration; that the lungs exhibit large livid spots; and that, under some circumstances, they appear putrified;

14th. That it attacks the principle of the irritability of the muscles, although it does not affect the irritability of the heart;

15th. That it is not poisonous to snakes and vipers. (*Traité sur le Venin de la Vipère,* par Fontana, tom. ii. p. 83—124. *Florence,* 1781.)

OF THE *WOORARA.*

946. The Woorara is a poison, with which the Indians of Guyana arm the points of their arrows: it does not appear to differ much from the *Ticunas.* According to *Bancroft,* it appears to belong to some species of climbing shrub.

ACTION OF THE WOORARA ON THE ANIMAL ECONOMY.

Experiment 1st. A small quantity of Woorara in powder, was applied to a wound made on the side of a Guinea-pig. Ten minutes after, the animal was no longer able to walk, he became completely motionless, except that he exhibited a few slight convulsive movements. A short time after, he was sunk into a state of great insensibility; his breathing became difficult, and ceased altogether fourteen minutes after the application of the poisonous substance. The thorax was opened: the heart was beating seventy strokes in a minute, and contained blood of a dark colour; the contractions of the heart continued for several minutes; the brain and the wound appeared not at all affected.

Two grains of Woorara applied in the same manner, produced the same symptoms at the expiration of twenty-five minutes, and the animal died thirteen minutes after. Its action was more rapid, and shewed itself at the expiration of five or six minutes, when a large quantity was applied, or when a slight hæmorrhage took place of the vessels to which it was applied.

Experiment 2nd. A small quantity of Woorara was introduced into a wound made in a young cat. He was affected by it in a few minutes, and fell into a state of lethargy, and of partial insensibility; he remained in that state for an hour and a quarter, when the application of the poison was repeated. Four minutes after this repetition, respiration entirely ceased, and he appeared to be dead; but the heart still beat about a hundred and four strokes in the minute. The animal was placed in a temperature of 85° of Fahr.; the lungs were artificially inflated at about the rate of four times per minute; the action of the heart continued regularly; the artificial re-

spiration was suspended for four minutes; the pupils were seen to dilate or contract as the light was diminished or increased; the saliva flowed from its mouth; a few tears appeared on its eyelids; but it remained insensible and motionless. At the expiration of sixty-four minutes, there were seen some slight involuntary contractions of the muscles, and an appearance of efforts to breathe: these movements continued, and became more frequent. An hour after, he gave, for the first time, signs of sensibility when roused, and breathed spontaneously twenty-two times in the minute. The artificial respiration having been discontinued, he remained forty minutes in a profound sleep, then awoke all at once, and began to walk about. The next day, he appeared somewhat indisposed; but he recovered by degrees, and in the end was restored to perfect health.

Experiment 3rd. A small quantity of Woorara was applied to a wound made in a rabbit: four minutes after, he appeared dead; but the heart did not cease to beat. He was placed in a temperature of 90° of Fahr. (32, 22, Therm. Centigr.) and the artificial respiration was employed. The pulsations of the heart were carried to about a hundred and fifty per minute. For more than three hours the pulse was strong and regular; it became weaker in the end, and an hour after the circulation had entirely ceased. During the whole of that time, there was no appearance of the return of sensibility.

Experiment 4th. The spinal nerves were cut before the place where they unite to form the axillary plexus: a certain quantity of Woorara was then applied to two wounds made in the anterior part of the arm, which produced the same effect, as if the nervous communication had not been intercepted.

Experiment 5th. The thoracic duct of a dog was tied a little before its entrance into the veins: the Woorara was applied to a wound in the posterior extremities, and produced

all the symptoms of poisoning. It was ascertained, by opening the body, that the circulation had been completely interrupted in the thoracic duct.

Experiment 6th. The Woorara was applied to the inferior extremity, and the limb was strongly tied above, to prevent all communication by means of the blood-vessels. The animal did not experience any of the effects peculiar to this poison, and did not die. (*Philosophical Transactions*, year 1811, p. 194, *et sequent*. *Mémoire de M. Brodie*, year 1812.)

947. *M. Brodie* concludes from these facts,

1st. That the Woorara is absorbed by the veins;

2nd. That it destroys the functions of the brain, and consequently that respiration ceases in a short time after.

OF CAMPHOR.

Physical and Chemical Properties of Camphor.

948. Camphor is a vegetable substance, considered as one of the numerous immediate productions of vegetables. Chemists have already discovered it in several of the laurels, in a great number of the *Labiatæ*, and in some of the *Umbelliferæ*. Among the laurels, the species designated by the name of *Laurus Camphora*, Lin., is that which contains the greatest abundance. This plant abounds in China and Japan; the Camphor may be extracted, by boiling in water the roots and wood cut into small pieces; the Camphor then quickly becomes volatilized, and attaches itself to small pieces of rice straw, previously disposed in the inside of a cap of earth, with which the iron pots in which it is boiled are surmounted.

The Camphor thus obtained, is in the form of small grains of a grayish colour, which are purified in Holland, in England, at Berlin, and Paris: to this effect, they begin by removing, by means of a sieve, the more gross extraneous bodies; they then mix it with about a sixteenth part of slacked lime, or

of carbonate of lime, and sublime it with a gentle heat, in mattrasses of glass flattened at the neck and base.

When Camphor is to be obtained from the *Labiatæ*, they begin by separating the essential oils with which it is united, and leave them to a spontaneous evaporation; by this means the oils become volatilized, and the Camphor remains behind. *M. Proust*, who was the first that made known this method, has extracted a sixteenth part of Camphor from the essential oil of rosemary, a ninth part from that of marjoram, a seventh from that of sage, and more than a fourth from that of lavender. (*Ann. de Chimie*, tom. iv. p. 179.)

There is yet one other plant which, according to *M. Correa de Serra*, has the greatest affinity to the *Shorea Robusta*, from which Camphor may be extracted, which the orientals esteem more than that of the *Laurus Camphora*. The tree which furnishes it grows in Sumatra. All that is necessary in order to obtain this *immediate principle* is, to make an incision, and to wash the production which flows from it: by this means it is freed from extraneous bodies.

Thus purified, the Camphor is a solid substance, of a white colour, transparent, and lighter than water; its specific gravity is as, 0,9887; it is of a fatty consistence; it is ductile, granulated, and its taste is bitter, hot, and pungent; its smell is very strong, and rather disagreeable; it crystallizes commonly in pyramids of six faces, or in square layers. When exposed to the action of heat in close vessels, the Camphor volatilizes with the greatest facility; it is even volatile at the ordinary temperature, as any one may be convinced by examining the crystals formed on the upper part of the drawers in which it is commonly kept.

When ignited in the open air, it burns with a white flame, after the manner of substances highly hydrogenated; it exhales an abundant vapour, and becomes decomposed. This experiment may be made by putting a small piece of Cam-

phor on water, and applying to it a body in a state of combustion.

Water can only dissolve $\frac{1}{1152}$ part of its weight of Camphor; but it may be combined with this fluid, by means of some mucilaginous body.

Alcohol and common brandy dissolve a tolerably large quantity of it: these solutions are decomposed by water, and the Camphor is precipitated of a white colour. The product is dissolved in a fresh quantity of alcohol.

The acetic acid copiously dissolves Camphor; it may even be said that it is its best solvent.

The nitric acid likewise dissolves this *immediate principle*, and the fluid separates into two portions; the one, superior, having an oily appearance, contains a great deal of Camphor, and of highly concentrated nitric acid; the other, inferior, but little camphorated, contains nitric acid very weak. It appears then that Camphor possesses to a certain degree the property of separating from the nitric acid a great quantity of water, acting thus in a manner similar to the salifiable bases. However that may be, the mixture resulting from the action of these two substances, when distilled several times, furnishes a certain quantity of Camphoric Acid, the formation of which implies the decomposition of part of the nitric acid. In fact, the oxygen acts upon the hydrogen and carbon of the Camphor, and nitrous gas is disengaged.

Olive oil is capable of dissolving a very great quantity of Camphor, provided the temperature of the mixture be a little raised.

DELETERIOUS ACTION OF CAMPHOR.

949. Camphor, when introduced into the stomach of dogs in the dose of two or three drachms, produces serious symptoms, followed almost constantly by death; its deleterious properties are still more energetic if injected into the veins.

What is the mode of action of this poisonous substance?

Experiment 1st. A dog of small size was made to take two drachms of Camphor, triturated with the yolks of two eggs. At the end of six minutes, the animal seemed to be agitated; he ran rapidly round the laboratory, stopped all at once, resting strongly upon his fore feet, agitating the muscles of the face in a convulsive manner. A moment after, the convulsions became general; he fell down on the side, having the head strongly reflected backward, and his extremities in a state of extreme agitation; the eyes, which were starting, and, as we may say, out of their sockets, presented a remarkable injection of the conjunctiva, and were insensible to external impressions: the animal could not hear, and had entirely lost the use of his intellectual faculties; the mouth was filled with a thick foam; the tongue and gums were somewhat livid; the breathing difficult, and accelerated. At the end of this attack, which lasted four minutes, the animal vomited a small quantity of soft and fluid matter, composed partly of the substance ingested; he instantly rose up, and suffered no more afterwards.*

Experiment 2nd. Three drachms of Camphor, dissolved in an ounce and half of olive oil, were given to a dog of middle size; the ligature of the œsophagus was made in order to prevent vomiting. After a few minutes, the animal appeared restless, he staggered in his walk, and the muscles of the head exhibited some convulsive movements. These symptoms were immediately followed by a general attack, which lasted nearly a minute and a half, and during which the animal remained lying down on the side; his head was nearly in the usual position, and all the muscles in a state of great agitation; the organs of the senses were insensible to the surround-

* I repeated with *Dr. Courrant*, my friend and pupil, the greatest part of the physiological experiments concerning Camphor and the *Cocculus Indicus;* and he made them the subject of an inaugural dissertation, which he sustained at Paris, in the month of January, 1815. No. 5.

ing objects; the eyes were starting from the head, and the breathing as it were suspended. After the cessation of these symptoms, he remained twenty minutes without appearing to experience any notable action on the part of the poison; he walked about freely, and seemed to have recovered the use of his senses. A moment after, he began to experience a difficulty in walking; his head was thrown back, as it were by shocks, and the anterior limbs grew weak; at one time making a few steps backwards, he stopped all at once to support himself on the hind legs; at another time, he turned round, describing a circle of a tolerably large diameter. This state of things continued ten minutes: then a most violent attack commenced; the animal all at once fell backwards, reflecting back the head upon the vertebral column, as if to tumble over; the muscles of the whole body, especially those of the extremities, and of the lower jaw, were agitated with great violence; horrible cries attested the pains to which he was a victim; the insensibility of the organs of sense became complete; the mouth was filled with foam, the tongue and gums were somewhat livid; the breathing, which was very laborious, was accompanied by the exhalation of a smell of Camphor. The animal expired in this state seven minutes after the beginning of the last attack. He was immediately opened, and the blood in the left ventricle was found to be of a deep red colour, the lungs were subsided, of a texture more tight than usual, and visibly injected.

This experiment was repeated on several other dogs, which were only made to take two drachms of Camphor, and presented the same results.

Experiment 3rd. At eleven in the morning, three drachms of Camphor dissolved in four ounces of oil, were introduced into the stomach of a small and extremely weak dog, and the œsophagus was tied. At half past eleven, the animal had a convulsive attack, which lasted five minutes. At half past twelve, a fresh attack. At a quarter past two, continued con-

vulsive movements in the different parts of the body, and especially in the muscles of the jaws; the mouth almost constantly open. At five, in the same state; the animal had not ceased for an instant to have the mouth open, as if he sought to introduce a greater quantity of air. At six, he was expiring: he died an hour after. He was opened the next day: the stomach contained about two ounces of a brownish stringy fluid; the mucous membrane, which was inflamed, presented several longitudinal bands of a bright red, and others of a circular form of a blackish red; there was no ulceration. The brain was not the seat of any remarkable alteration.

A similar result was obtained on giving to another dog two drachms of Camphor dissolved in three ounces of oil.

Experiment 4th. When fifteen or twenty grains of Camphor dissolved in three or four drachms of oil of olives are injected into the jugular vein of a dog, it is observed that the injection is scarcely terminated before the animal experiences all the phenomena which we have just described in the preceding experiments, and he dies in the course of four, six, or eight minutes, according to his strength.

Experiment 5th. At two o'clock, six grains of Camphor dissolved in three drachms of oil of olives, were injected into the jugular vein of a small and very strong dog. At six in the evening, the animal, who as yet had experienced no inconvenience, had vertigoes; his posterior extremities were feeble, his breathing somewhat difficult, the pulsations of the heart as before the operation. He died the next morning at four o'clock. The digestive canal appeared sound; the lungs contained air, and were infiltrated with serosity.

Experiment 6th. Six grains of Camphor dissolved in the smallest possible quantity of oil, were applied to the cellular texture of the back of a robust dog. Five days after, the animal had suffered nothing, and took his food with an appetite.

Experiment 7th. The same experiment was repeated upon

a dog of middle size, with the same dose of Camphor and oil, which was placed in contact with the cellular texture of the inside of the thigh. At the expiration of ten hours, the animal had not experienced any sensible phenomenon. Twenty-four hours after the application, he was under the influence of the poison, and was in a state of agitation; the limbs exhibited convulsive movements, and he died two days after. The limb operated on presented no remarkable alteration; the bladder was full of urine; the other organs appeared to be sound.

This experiment being repeated, furnished the same results.

Experiment 8th. The œsophagus of a small dog tolerably robust, was detached and perforated: half an ounce of Camphor divided into small pieces was introduced into his stomach, enclosed in a paper cone; the œsophagus was tied, to prevent vomiting. The animal died two days afterwards, without having been agitated by any convulsive movements, or uttering the least complaint; he had only been in a state of great dejection. On opening the body, it was observed, that the stomach contained a few pieces of Camphor, floating in a blackish stringy fluid, which lined the inside of this viscus; the mucous membrane, which was of its natural colour, presented, near the pylorus, four longitudinal ulcers, covered by a black substance, which could easily be detached. The edges of these ulcers were elevated with some considerable projection.

Other dogs, upon which this experiment was repeated, and that had only been made to take three drachms of Camphor in fragments, presented the same phenomena, except that death did not take place sometimes until the end of the fourth, or of the sixth day.

Experiment 9th. Half an ounce of Camphor in fragments, about half of which was still more divided, was introduced into the stomach of a large dog, whose œsophagus was tied. Four hours after the operation, the animal experienced all

the nervous symptoms described in Experiment 1st., with this difference, that the attack, although violent, appeared every instant to be at an end, and to be immediately renewed. Its duration was six minutes. After this attack the animal continued in a state of extreme dejection, and he did not die till six days afterwards. The body was opened, and it was observed, that the internal surface of the stomach was sprinkled over with ulcers.

Experiment 10th. We wished to ascertain what was the action of the artificial Camphor, prepared according to the process of *Kind*, by passing a current of muriatic acid gas through oil of turpentine. To this end, a robust dog was made to take half an ounce of this substance dissolved in an ounce and half of oil of olives, and none of the effects resulting from Camphor, were produced in the animal. He was dejected, and did not die till the seventh day. On inspecting the stomach, several small ulcers of an oval figure were observed, but which differed totally in appearance from that in Experiment 4th, produced by the natural Camphor.

950. From all the preceding statements we may conclude:

1st. That when three or four drachms of Camphor, divided by any oil, are introduced into the stomach of a dog, the Camphor is quickly absorbed, carried into the circulation, and that it acts by powerfully exciting the brain, and the whole nervous system, and by producing death in a very short time, amidst the most horrible convulsions.

2nd. That when it is directly mixed with the blood, by means of injection into the veins, it produces the same phenomena, but in a manner much more rapid.

3rd. That it produces the same symptoms, but in a manner much slower, when applied to the cellular texture of the inside of the thigh.*

* In employing frictions with Camphorated oil, to the interior part of the thigh, in the human species, a direct action is observed to take place on the kidneys and bladder. Some years ago, several practitioners

4th. That, in almost every case, the animals die of the asphyxia which results from the cessation of the respiration, or at least from the difficulty with which that function is carried on during the violent convulsive succussions.

5th. That the analogy which exists between the action of Camphor, and that of the different species of *Strychnos* described by *M. M. Magendie* and *Desportes*, is not sufficiently great for us to consider their effects as identical, the *Strychnos* affecting particularly the spinal marrow, whilst the Camphor acts on the whole nervous system, and especially on the brain.

6th. That Camphor is not digested, and that it exerts a local action capable of producing ulcerations of the mucous membrane of the stomach, and consequently death.

7th. That if Camphor in fragments produce nervous effects, it is in consequence of a more minute division of some of its parts.

8th. Lastly, that the artificial Camphor in the dose of half an ounce, even when divided by oil, produces no lesion of the nervous system, and confines its action to the production of a few small ulcers in the mucous membrane of the stomach.

951. In order to conclude the history of the deleterious qualities of Camphor, we shall here present some observations, which tend to prove that this substance acts on the human species as on dogs.

Observations.

1st. M. . . . . of a spare rather than gross habit, with a white skin, and red colour in the cheeks, of a constitution seldom injured by diseases, but subject to slight nervous affections, had experienced for several days a constriction of the

of Brest employed this method with success, in order to moderate the irritation produced by blisters on these organs. *M. Chrestien* likewise reports an observation of this kind. It is to be presumed, that the Camphor, under these circumstances, is absorbed.

sphincter of the anus, which caused him at times very sharp pains. During this time he had recourse to mucilaginous glysters, but without experiencing from them any relief. Half a drachm of Camphor was prescribed to be added to the glyster; he only took eighteen grains; the pain was entirely suspended for about an hour. The next day, half a drachm of Camphor was administered to him in a glyster; a few minutes after, he felt a taste of Camphor in the throat; at the expiration of a quarter of an hour, not having passed the glyster, he experienced a sensation of disquietude, and a general uneasiness. As that painful state continued to increase, he jumped out of bed, and was surprized to find himself lighter than usual; it appeared to him that he scarcely touched the ground, and that he skimmed it, as it were, in walking. He went down stairs to seek assistance; his step was uncertain and staggering; he walked about, making gesticulations, and begging with great earnestness a glass of wine. His face was pale; his eyes haggard; his features altered: he experienced a slight coldness over the whole extent of the skin, with a sense of numbness in the hairy scalp, but more especially at the back of the neck; the skin was cool, and moist in some places; the pulse feeble and tight: it appeared to himself, that he had a disposition to fainting; his senses were particularly affected; he was in a state of lively disquietude, and yet did not believe that he was in danger. He was under great emotion, and shed tears, which much astonished him, because he felt that they were without motive, and that he could not stop them, as they were involuntary. In this situation he continued about half an hour, the symptoms gradually diminishing. The wine which he took contributed greatly to his recovery. He exhaled by the mouth a very strong smell of Camphor, which continued the whole day; the painful constriction was not felt during the whole of this time; it did not return till four and twenty hours after,

and gave way at last entirely to twelve grains of Camphor administered in two doses in the same manner. (Observation communicated by *M. Edwards.)*

2nd. A man, who was subject to an hypochondriacal affection of the most severe kind, and which was the cause of very frequent spasmodic symptoms, swallowed by mistake, at one single dose, two scruples of Camphor dissolved in oil of olives: the effects of this act of imprudence were, vertigo, coldness of the extremities, great anxiety, a cold sweat over the head, slight delirium, accompanied with drowsiness; the pulse was small and languishing. To these symptoms shortly succeeded a considerable heat, a more frequent pulse, red urine; but the patient was soon after made amends for this accident, being entirely freed from his spasms. (Report from *Hoffmann* by *M. Hallé*, in a Memoir inserted among those of the *Société Royale de Médecine*, p. 66.)

OF THE *COCCULUS INDICUS.*

952. The *Cocculus Indicus* is the fruit of a shrub, which grows naturally in the sand, in the midst of the rocks, on the Coast of Malabar, in the Island of Ceylon, and in other parts of the East Indies. It is found more particularly under the shade of great trees, the trunks of which it embraces, climbing up even to the highest branches.

This fruit is blackish, of the size of a large pea. The ligneous pericarp is covered with rugosities, and contains a kernel of a bitter taste, remaining a long time whitish, brittle, round, sometimes oblong, and somewhat kidney-shaped, divided into two parts or lobes, by a sinuous partition, well defined, and as it were ligneous.

M. Boullay, a celebrated apothecary at Paris, and a distinguished chemist, has lately endeavoured, at the solicitation of *Professor Chaussier*, to ascertain the nature of the principles which enter into the composition of the fruit of the

Menispermum Cocculus. From the analysis of it, given by him, it results, that the seed of this fruit, when isolated from the ligneous perisperm in which it is enclosed, contains, 1st, about half its weight of a fixed oil, *ceraceous concrete;* 2nd, an albuminous vegeto-animal substance; 3rd, a particular colouring matter; 4th, 0,2 of a new bitter principle, crystallizable and poisonous, to which *M. Boullay* has given the name of *Picrotoxine;* 5th, 0,5 of a fibrous part; 6th, some malic acid, probably in the state of acidulous malate of lime and potash; 7th, sulphate of potash; 8th, muriate of potash; 9th, a calcareous phosphate; 10th, a small quantity of iron and silex. (*Analyse Chimique de la Coque du Levant,* Paris, 1812.)

953. The deleterious effects produced on fishes, birds of Paradise, goats, and wild cows, crocodiles, &c., have induced some physicians to make experiments on living animals, with the intention of ascertaining its mode of action.

M. Goupil, a physician of Nemours, has communicated to the Society of Medicine some interesting facts on this subject. The following are the conclusions, which he is of opinion may be drawn from his labours:

1st. The Cocculus Indicus is not only a poison for fishes, but also for different carnivorous quadrupeds, and very probably for the human species.

2nd. That this poison may be classed amongst the irritating vegetable poisons.

3rd. That the ligneous covering of the Cocculus Indicus possesses only an emetic property, even to fishes, and in proportion to the dose in which it is administered.

4th. It is in the kind of kernel contained in this covering, that the poisonous property resides.

5th. That the poisonous part of this substance is not sensibly changed by the gastric juices, and the vital action of the organs of digestion.

6th. That it passes, on the contrary, into the absorbent

system with all its properties; the flesh of those fishes that have eaten it, irritates the stomach and bowels of the animals to which it is given, nearly in the same manner as the Cocculus Indicus itself.

7th. All the fishes who eat it do not die in an equal space of time. Roach, pollard, breme, perch, tench, barbel, such is the order nearly in which these fishes appear to resist: the roach is killed the easiest of all; the barbel is the last to die. The barbel is, of all fish, that whose flesh the most frequently occasions accidents in those animals who eat it, probably because these fish taking a longer time to die, the poison is longer subjected to the action of the digestive juices, and a considerable quantity of it is consequently absorbed. (Bulletin of the Society of Medicine, November, 1807.)

M. Boullay, in his treatise on the Cocculus Indicus, asserts, that a grain of *Picrotoxine*, mixed with one *gramme* of crumb of bread, proved sufficient to kill a strong frog that was made to swallow it; whilst the concrete oil, the vegeto-animal substance, the colouring part, and the water distilled from this seed, produced no ill effects on the same animals, which were made to swallow much more considerable quantities.

M. Boullay concludes from these experiments, that the *Picrotoxine* is the only matter to which the Cocculus Indicus owes its deleterious powers.

In comparing the effects of the *Picrotoxine* with those of the Cocculus Indicus, we have endeavoured to ascertain the mode of action of these two substances.

Experiment 1st. When robust dogs are made to swallow three or four drachms of the Cocculus Indicus as finely pulverized as possible, and the œsophagus is tied immediately after the ingestion of the poisonous substance, it is observed that these animals very quickly make repeated efforts to vomit. At the end of twenty, twenty-five, and thirty minutes they begin to stagger; their eyes appear haggard and project-

ing; their muscles become agitated with a trembling, at first slight, but which gradually increases; in a short time afterwards, their features become greatly altered by the convulsive movements of the different muscular parts of the face; contorsions, and horrible grimaces give notice of a general nervous attack; all at once they make a few steps backwards, stretch out the fore paws; they stop, and with difficulty avoid falling while they attempt to rest on their posterior extremities. The head in a short time experiences a violent shock, similar to that resulting from a strong discharge of the electric fluid on frogs; these commotions are sometimes so violent, that this part is bent backwards upon the trunk, and a tumble is produced backwards, in which the head first strikes the ground with violence, and the body is rolled round in every direction. These effects cease for a minute or two; the animals rise up, attempt to advance a step or two forward, but are soon attacked again: the severity and frequency of these paroxysms go on increasing, and the most alarming convulsions are perceived; lying down commonly upon their side, they agitate their paws with extreme rapidity and violence; the head and tail are more or less reflected upon the posterior part of the vertebral column; the organs of sense no longer exercise their functions, and any one may move the animals, push them, and make any noise near them, without their shewing the least sign of perception: the mouth becomes full of foam, the tongue and gums are more or less livid, the conjunctive membrane injected, the breathing accelerated and laborious; sometimes in this general contraction, an involuntary emission of urine and excrement takes place. This situation continues two or three minutes, the animals appear calm for a few seconds, and quickly fall again into a fresh paroxysm; at length they finish, by expiring after one or two attacks. Death commonly takes place half an hour or an hour after the ingestion of the poison.

On opening the bodies, no lesion is perceived throughout

the whole extent of the digestive canal; the left ventricle of the heart contains blood of a brownish red colour, and the lungs are little crepitating, of a tighter texture than usual, and exhibit patches of a dark colour.

Experiment 2nd. If instead of tying the œsophagus after the introduction of the Cocculus Indicus into the stomach, they are allowed the power of vomiting, they throw it up almost entire, and sometimes escape death, although they frequently experience two or three attacks similar to those we have described.

Experiment 3rd. A drachm and forty-eight grains of Cocculus Indicus finely powdered and mixed with an ounce of water, was applied to the cellular texture of the inside of the thigh of a small dog. At the end of ten minutes, the animal had experienced a convulsive attack similar to that we have been describing (*Experiment* 1st), and died forty minutes after the application of the poisonous substance. He was immediately opened. The heart was no longer contracting, it contained fluid and blackish blood; the lungs appeared wrinkled, and distended with blood; the other organs presented no alteration.

Experiment 4th. If the fruit of the *Menispermum Cocculus* be only grossly bruised, and four or five drachms be introduced into the stomach of dogs of small size, none of the nervous symptoms above enumerated take place, even when the œsophagus has been tied to prevent vomiting: under these last circumstances only, the animals do not die, till after having been in a state of great dejection for four, five, six, or eight days. On opening the body, all the fragments of the Cocculus Indicus are found in the stomach, and the texture exhibits no alteration.

Experiment 5th. A small and strong dog was made to swallow twelve grains of *Picrotoxine* not purified. At the end of half an hour, the animal, who as yet had experienced no inconvenience, vomited a small quantity of yellow fluid matter,

and fell into a paroxysm of the most violent kind. The muscles of the face were at first agitated with slight convulsive movements, which in a short time became very violent, so that the animal made horrible grimaces; he walked staggering, and always backwards; the fore-feet resting strongly on the ground, hindered him from falling when he stopped. This state of things continued three minutes; he then fell down on the side; the convulsions became general and shocking; the head and the tail, which were strongly bent back upon the posterior part of the vertebral column, formed an arch with the trunk; the fore paws performed frequent movements, and similar to those of a dog swimming. The eyes, which were red, and starting, were every instant shut by the agitation of the eyelids; the animal shewed no sign of sensibility on the approach of such objects as might have excited it; the tongue was of a livid colour, and surrounded by a great quantity of white and very thick foam. The paroxysm continued twelve minutes, and terminated in a trismus, which was preceded by a grinding of the jaws. During the eight minutes immediately succeeding this paroxysm, the animal exhibited no other phenomena than a state of general insensibility, and an extreme difficulty of breathing. He expired fifty-three minutes after the ingestion of the poisonous substance. The examination of the body discovered no lesion of the digestive canal.

Experiment 6th. Another very strong dog was made to take four grains and a half of *Picrotoxine,* perfectly pure. At the end of a quarter of an hour, the animal vomited a small quantity of yellowish and fluid matter; the vomitings were repeated five times in the course of an hour, without any nervous symptom taking place. The next day, the animal was perfectly well.

Experiment 7th. A grain and half of pure *Picrotoxine,* dissolved in half an ounce of water, were injected into the jugular vein of a small and tolerably strong dog. At the end of a minute, the animal experienced some slight convulsive

movements in the face; the eyes became haggard, and he fell immediately on his side; then the attack became general, and was in every respect similar to that described in Experiment 5th; it continued eight minutes, after which the animal remained tranquil, and expired twenty minutes after the injection. On opening the body, it was perceived that the blood in the left ventricle was of a brown red colour; the lungs were wrinkled, very little crepitating, and exhibited patches of a deep colour.

The same phenomena take place when a drachm of the pure liquor of *Picrotoxine* is injected into the jugular vein.

954. It results from these experiments,

1st. That the *Cocculus Indicus* pulverized is an active poison for dogs;

2nd. That it acts like Camphor on the nervous system, and especially on the brain;

3rd. That it ought not to be considered as an acrid, irritating poison, as *M. Goupil* had supposed it to be;

4th. That the active part of this poison is the *Picrotoxine;*

5th. That when introduced into the stomach, not much divided, its effects are confined to the production of nausea, and some vomiting.

6th. Lastly, that vomiting appears to be the best remedy to oppose to the symptoms which it occasions whilst it still remains in the stomach.

OF POISONOUS MUSHROOMS.

OF THE AGARIC.

Characters of the Genus. The pileus commonly pedunculated, doubled downwards; the laminæ are scarcely ever anastomosed with one another, and between them are found the *Gongyli.*

AGARIC WITH INCOMPLETE *VOLVA.*

Of the *Fausse-Oronge (Agaricus Muscarius*, Lin., *Agaricus Pseudo-Auruntiacus* of Bulliard.)

Its pileus attains to the diameter of from fourteen to eighteen centimetres; it is at first convex, and afterwards nearly horizontal; of a beautiful scarlet colour, deeper in the centre, disposed somewhat in rays near the edge, and spotted over with portions of white skin, which are the remains of the volva; this volva does not completely cover it at its first appearance, and forms a few scales along its stem; this last is thick at its base, then cylindrical, full, white, from eight to twelve centimetres in length; the gills (*Laminæ*) are white, unequal, covered, when young, with a membrane which descends upon the stem, and forms its collar.

ACTION OF THE *AGARICUS MUSCARIUS* ON THE ANIMAL ECONOMY.

Experiment. Three of these Mushrooms, mixed with pastry, were given to a dog of middle size. Three hours after, the animal, who had hitherto experienced no inconvenience, felt a trembling and weakness in the extremities. This state of things continued about four hours, during which time he occasionally uttered complaints; after which, he fell into a state of stupor; his breathing was slow and deep, and he uttered from time to time plaintive cries; at one time, he rolled himself on the ground; at another, he whirled round, with sudden shiverings, which resembled electrical shocks. This state continued eight or nine hours, without the animal having passed any evacuation. He was made to swallow vinegar, which, far from diminishing the symptoms, aggravated them. Eleven or twelve hours after the appearance of the first symptoms, three grains of the antimoniated tartrate of

potash were given him in two spoonfuls of water, which did not however produce any evacuation. At the end of two hours, a small quantity of olive oil was administered to him; and he vomited, five hours after, a part of the Mushrooms: he afterwards vomited again some portions of Mushroom mixed with whitish mucus, and was completely cured in a few days, by means of a certain quantity of milk.

Observations.

1st. *M. Paulet*, who made the above experiment, relates several cases of poisoning by the *Agaricus Muscarius*. The patients experienced nausea, vomitings, faintings, anxiety, a state of stupor and insensibility, and a sense of stricture in the throat. They had neither gripings nor severe pains. A few grains of emetic tartar were administered to them with warm water; they had evacuations both upwards and downwards, threw up the Mushrooms with some bloody matter, and were slowly restored to health by means of emollient medicines: some few experienced pains of the belly, and were treated by emollient fomentations and opiates.

2nd. Several Soldiers, at the distance of two leagues from Polosk, in Russia, ate some Mushrooms, which are supposed to have been the *Agaricus Muscarius*; four of them, being men of a strong constitution, believed themselves exempt from the bad consequence of them, since the greatest part of their comrades were already labouring under symptoms more or less severe: these obstinately refused to take an emetic. In the evening, the following symptoms made their appearance: anxiety, suffocation, ardent thirst, excessively severe gripings, pulse small and irregular, cold sweats over the whole body, great change in the features; a violet tinge of the tip of the nose and of the nostrils, as well as the lips, general trembling, inflation of the abdomen, evacuations by stool of a very fetid matter. These symptoms went on increasing in violence; the men were conveyed to the hospital. A coldness, and a livid

colour of the extremities, a fatal delirium, and the most severe pains, accompanied them to the last moment of their existence: one of them died a few hours after his reception into the hospital; the other three experienced the same fate, and expired in the course of the night.

Appearances on Dissection. The first exhibited the following phenomena: evacuation of a blackish and greenish frothy matter; abdomen inflated; the stomach and intestines were greatly distended with some extremely fetid gas; their interior surface exhibited marks of inflammation, and some gangrenous points; in several places the mucous membrane of the small intestine was destroyed; the stomach contained a small quantity of a blackish fluid. The second was nearly in the same condition, with this difference only, that the interior of the stomach exhibited a kind of inflammatory congestion near the pylorus; the liver was prodigiously swelled; the gall-bladder filled with thick bile of a dark colour. The third and fourth exhibited the same lesions as the first, but much more decidedly marked; broad gangrenous spots were perceived both in the stomach and intestines, where putrefaction appeared already far advanced." (Inaugural Dissertation of *M. Vadrot, Paris,* 1814, p. 26.)

3rd. *Losel* relates that six men died in consequence of eating of this Agaric. (*Flora Pruss.* p. 88, year 1703.)

4th. The inhabitants of Kamtschatka prepare, from the *Agaricus Muscarius* and the *Epilobium Angustifolium,* a very intoxicating drink, which sometimes excites a fatal delirium, accompanied by despair. The servants, who drink the urine of the persons so intoxicated, likewise feel the effects of this fatal Mushroom. (Krascheminckow, *Histoire Naturel du Kamtschatka,* p. 209.)

AGARIC WITH COMPLETE VOLVA.

OF THE BULBOUS AGARIC (*AGARICUS BULBOSUS* OF *BULLIARD*).

It rises to the height of from fifteen to eighteen *centimetres;* when young, it is entirely covered by a *volva,* which splits, remains permanent on the base of the stem, and leaves frequently patches of it adhering to the pileus; the stem is cylindrical, swelled at its base, frequently curved when old; the pileus is more or less convex, but never becomes concave; the gills are numerous, unequal, white, and extend only to within two *millimetres* of the pedicle; they are covered, when young, by a membrane, which is detached from the edge of the pileus, and remains adhering to the top of the stem, in the form of a collar, entire and flattened. The whole plant is of a dirty yellowish white colour, and becomes brown as it grows old; its pileus is sometimes viscid.

OF THE SPRING AGARIC (*AGARICUS BULBOSUS VERNUS* OF *BULLIARD*).

NOTE.—This Mushroom and the preceding answer to some varieties of the *Hemlock Mushroom* described by Paulet.

Characters. When young, it is completely covered by its volva, which bursts at the top, and allows a passage to the Mushroom; the stem is cylindrical, thick, and furnished with a volva at its base, full, from five to seven centimetres long. The pileus is at first convex, then concave, because the edges turn up as they grow old. The gills are unequal, and covered, while young, by a membrane, which extends from the stem to the edge of the pileus: this membrane comes off, and remains on the top of the stem, in the shape of an entire collar. This plant is white, sometimes rather yellowish at the top.

ACTION OF THE HEMLOCK MUSHROOM *(ORONGE-CIGÜE)* ON THE ANIMAL ECONOMY.

Experiment 1st. A strong dog was made to swallow some pastry, containing three drachms of this Mushroom in a state of division. At the end of five hours, the animal fed as usual, and had not experienced any inconvenience. Ten hours after its ingestion, he made some efforts to vomit; his extremities grew weak; he lay down, fell asleep, and died shortly after in convulsions. The stomach and intestinal canal were lined with a thick and yellowish mucus; the folds of the stomach, and the interior of the duodenum, exhibited a few livid spots; the gall-bladder was green.

Experiment 2nd. Two of the green Hemlock Mushrooms hashed and mixed with paste, were administered to a dog. At the end of eleven hours, the animal, who had hitherto exhibited no remarkable phenomenon, vomited. A few hours after, he passed some white fæces, and trembled. He soon after lay down, and experienced some convulsive movements; in this condition he continued for several hours, and was affected with singultus; some sharp pains, from time to time, caused the animal to shiver; at length all the symptoms of apoplexy made their appearance, and he continued, at intervals, to have convulsive movements. He was made to take vinegar at different doses, which roused him a little; but he fell quickly into his former condition. He expired thirty hours after the ingestion of the poison. The digestive canal did not contain a single atom of the Mushroom; the interior of the stomach was spotted with reddish points; the mucous and muscular membranes of the intestines were destroyed; there remained only the serous coat, which presented, throughout its whole extent, spots of a livid red colour, which could be perceived on the outside.

Experiment 3rd. Half an ounce of the juice of the yellowish Hemlock Mushroom was given to a great dog, diluted with a little water. He immediately made violent efforts to vomit, and threw up a part of it. He experienced a real *Cholera Morbus* and convulsions, with a considerable diminution of strength, and died twenty-four hours after the ingestion of the poisonous substance. The interior of the stomach presented likewise several red points.

Experiment 4th. Several dogs were made to swallow the fluid obtained from the distillation of the same juice. They did not experience any bad symptom ; but the residue of the distillation, administered even in a small dose, proved fatal to all the dogs who took any of it. Death only took place four and twenty hours after the ingestion of it, and was preceded by the symptoms above described. The animals experienced no bad symptoms during the first ten hours. The interior coat of the stomach was strewed over with small red points: the whole of the intestinal canal was lined with a thick viscid and yellowish matter.

Experiment 5th. The watery extract of this plant produced death in less than four and twenty hours. The same thing occurred from a piece of these Mushrooms dried in an oven. The water in which some of these Mushrooms had been macerated for several hours, being administered to a dog, produced bloody stools and violent pains. The animal however recovered. Some other animals died, after having swallowed the pieces of Mushroom that had been thus treated with water.

Experiment 6th. The ingestion into the stomach of an ounce and half of alkohol, which had been made to digest for several hours over one of these Mushrooms well dried in an oven, and which weighed forty grains, produced death. The residue no longer possessed any poisonous properties, as it was administered to several animals without inconvenience. (PAULET, *Traité des Champignons.)*

Observations.

1st. Guibert, his wife, his daughter, two boys who were strangers, and a servant girl, ate at their dinner some of the yellowish Hemlock Mushroom, prepared with some stewed carp. At three in the morning, Madame Guibert, who had dined entirely off this dish, was awoke by a frightful dream, and some nausea; she threw up without difficulty a part of the dinner, and fell into a state of lethargy, which could only be interrupted by the efforts to vomit. An emetic was given to her; she unloaded her stomach, and felt relieved. She was perfectly restored about three weeks after.

One of the boys, and the girl, who had taken no emetic, died, after having experienced the same symptoms: the other boy, and the servant girl, having received timely assistance, were restored to health in the course of three weeks.

Guibert himself, experienced spontaneously a real *Cholera Morbus*, accompanied by very painful cramps, especially in the feet, with retraction of the limbs. He escaped. None of these persons experienced any fever: all of them, except Guibert, fell into a state of continual stupor.

2nd. Similar symptoms made their appearance in two persons of *Surènes*, and two others of *Melun*, who had eaten the same kind of Mushroom. Three of them, who received no medical assistance, died. The *Gazette de Santé* of the 18th of July, 1777, makes mention of the poisoning of five persons by the yellowish Hemlock Mushroom.

3rd. *Benoit*, his wife, and their child, at six in the evening, ate some of the white Hemlock Mushroom gathered and prepared the same day. The next day, nauseas, anxiety, and frequent faintings took place: the father and the child vomited copiously after having taken a strong dose of emetic tartar, some milk, and *theriaca*. The child died on the second day; the father expired a few moments after. A short time before death, he was in a state of extraordinary anxiety and stupor,

the belly was distended, the extremities cold, the pulse small and intermitting; he had frequent faintings, and was all over of a livid colour. The mother, who took no emetic tartar, on account of an uterine hæmorrhage under which she was labouring, had nevertheless vomited considerably on the second day; she was weak, pale, and in a state of great anxiety; her pulse, which had little appearance of fever, was feeble. An ordinary cathartic was prescribed for her, rendered aromatic by orange-flower water. Three hours after, she passed some Mushroom entire, and others, which were dissolved in yellowish mucosities; she felt herself better. She was then made to take some milk of sweet almonds, with a few drops of sulphuric ether, and a little orange-flower water; which gave her considerable relief. The day after, she was again purged, and with success; the hæmorrhage, which had been suppressed, again returned, and the patient experienced from time to time, oppression and faintings. Restorative and antispasmodic medicines were administered to her; but she recovered with great difficulty, and, five or six months after, was still extremely pale, and felt frequent pains of the head and stomach. She died of another disease some time after.

OF THE MOUSE-COLOURED MUSHROOM (*AGARICUS CONICUS* OF PICCO).

955. This Mushroom has been described also by *Micheli: Fungus e volva erumpens, pileolo leviter fastigiato, desuper murini coloris, inferne ex albo rufescenti, pediculo albo cylindrico.*

Mushroom projected, of a conical shape, of a gray mouse colour, and looking like satin underneath, with whitish laminæ, and a white stem, somewhat crooked, which rises to the height of from four to five inches, bearing a pileus of about one and a half in extent, the internal substance of which on being cut, appears to be composed of small grains of a gray colour,

which, at a little distance, make it appear of an ash colour. Its gills, which are mixed with small pieces of laminæ, are of a clean white colour, with a slight tinge of yellow. The stem, which itself is of a dirty white, is filled with a substance extremely white, and bears at its base the remains of a thin envelope, which covered the Mushroom.

ACTION OF THE MOUSE-COLOURED MUSHROOM ON THE ANIMAL ECONOMY.

Observations.

1st. A woman of Stupinis, her husband, three boys, and a girl, ate, on the 6th of October, at their dinner, two pounds of this Mushroom cooked with butter. About two o'clock in the morning, one of the children, seven years of age, complained of acute pains in the abdomen: some theriaca was administered to him. The mother, who had eaten plentifully of the dish, experienced a moment after, a violent cardialgia, with suffocation, and made great efforts to vomit. The same thing happened to the eldest child. The father also was attacked before day-light; the second son about nine o'clock, and the daughter, who had only eaten a very little, did not begin to complain till towards evening.

On the 7th of October, the child of seven years of age, was in a state of stupidity, suffered greatly in the abdomen, and was only able to take cold water; the belly became inflated; the child at intervals, uttered plaintive cries, very acute, although sunk into a state of complete lethargy. Towards noon, he experienced convulsive movements; the extremities became stiff, the pulse extremely small, and he died during an attack of cynical spasm. His body was covered with violet-coloured spots. The stomach and intestines were distended by a fetid-gas and corroded in their interior surface; near the pylorus were perceived some livid spots; the colon contained some live worms, and the remains of the Mush-

rooms mixed with a yellowish fluid; the liver was extremely bulky, pale coloured, and without consistence.

The mother, who complained of a suffocating anxiety, of cardialgia, with vomitings of a greenish and bloody matter, became yellow over the whole body, and was not able to breathe. The abdomen was in a state of spasmodic constriction; the navel forced in; the slightest pressure increased the retraction of the legs. She took only the theriaca, and died eighteen hours after the invasion of the symptoms, in a state of profound lethargy, and with cold sweats. There issued from the nostrils ichorous blood, and froth from the mouth. The abdominal viscera exhibited lesions similar to those of the preceding subject.

The child of ten years old, who had eaten nothing all day, but a quantity of grapes, was in a state of stupidity in the evening; he experienced the symptoms above described, and died in convulsions. The liver was extremely bulky. On opening the stomach, there issued so infecting a smell, that the examination of the other viscera was given up.

The girl had faintings, vomitings, and tight pains at the stomach; she refused to take an emetic; the pulse became frequent, small, and irregular; a singultus appeared from time to time; she felt a violent and burning cardialgia, anxiety, sensation of strangling, and extreme thirst. She was bled: the blood was black and livid, and she seemed to be somewhat relieved. She soon after, however, experienced suffocation, and a difficulty of swallowing; she was delirious, and had an hæmorrhage from the nose. Manna was administered to her, which procured some evacuations. On the third day, she expired in a lethargic state, amidst the most terrific anguish, shiverings, cold sweats, convulsions, and delirium. The same lesions of texture were observed as in the mother and the child of seven years; the gall-bladder was completely empty, and the part of the liver next the stomach, was soft and livid, whilst this viscus was white on its upper and anterior surfaces.

The eldest of the children experienced nervous colics, with retraction of the legs, cardialgia, frequent vomitings, palpitation of the heart, and a sense of strangling. The emetic tartar, administered in two doses, procured copious evacuations. A white decoction was afterwards given to him, and he was made to take every hour ten drops of the *Liq. Mineral. Hoffmann*, in two ounces of theriacal water, which seemed to relieve him a little; nevertheless, the gripings returned from time to time; he felt head-ache, a kind of heaviness of the stomach, delirium, and great anxiety, which obliged him frequently to change his place; fever came on; his eyes were inflamed. Some blood was taken away, and he obtained some relief. The bleeding was repeated in the evening, and a glyster administered; these means put a stop to the gripings of which he complained, and the fever was diminished. The next day, the tongue appeared loaded; three ounces of manna were prescribed for him, which procured beneficial evacuations. He was still very weak, felt a painful tension of the stomach, had some spittings tinged with blood, and some acid eructations, which were soon relieved by magnesia. The dose of Hoffmann's Liquor was gradually diminished, and the child recovered.

The father, who was sixty years of age, and had been evacuated by means of emetic tartar, had a copious dysentery which lasted till the third day. He remained nearly five days without uttering a word; the eyes fixed, and swimming with tears; the pulse small, slow, and languishing. He recovered by degrees; his digestion was performed without difficulty, and he had frequently bloody evacuations: the case of the eldest son was just the same. Both of them were treated with Peruvian bark, and balsamic syrup. A year after, they felt again the evils which they had suffered. (*Mémoires de la Société Royale de Médecine*, anno 1780, et 1781; Observation of *M. Picco*, p. 355.)

AGARICS WITHOUT A VOLVA.

Laminæ unequal; stem central; juice milky, commonly white, though sometimes yellow or red.

OF THE KILLING AGARIC (*AGARICUS NECATOR* OF BULLIARD).

It is of a red colour, bordering on yellow; its flesh is firm; as soon as cut into, a milky liquor issues out, which is acrid and caustic; the stem is cylindrical, full, naked, thick, of the length of ten centimetres, at most: its pileus is at first convex, afterwards flat, then concave in the centre; it is frequently larger on one side than on the other; sometimes it is marked with concentric zones; it does not exceed seven or eight centimetres in diameter; the surface is covered with hairy patches of a darker colour, which give it a hairy appearance, and disappear with age; the laminæ are unequal; the small number of those that are entire, form a sort of tuft at their insertion into the stem. It grows in woods at the latter end of summer.

Bulliard asserts, that a very small quantity of this Mushroom is required to produce the most fatal symptoms. Its juice is believed to produce terrible colics.

OF THE ACRID AGARIC (*AGARICUS ACRIS* OF BULLIARD).

It is white, except the laminæ, which, according to their age, are sometimes yellowish or reddish; the stem is naked, full, cylindrical, fleshy, from two to three centimetres in length, and almost as much in thickness; the pileus, at first convex and irregular, becomes afterwards flat, then concave, with the edges winding and undulating; this pileus is fleshy, about eight or ten centimetres broad; it exhibits no traces of con-

centric zones; the laminæ are numerous, unequal, frequently bifurcated, running a little down the stem.

OF THE CAUSTIC AGARIC (*AGARICUS PYROGALUS* OF BULLIARD).

Its stem is cylindrical, naked, full, of a yellow, livid, and earthy colour, three or four centimetres in length, and from eight to ten millimetres in thickness; its pileus is at first convex, then almost flat, with a slight depression in the middle, of the same colour as the stem, frequently marked with blackish concentric zones; it attains to a diameter of sixteen centimetres; its laminæ are numerous, somewhat reddish, unequal, adhering a little to the stem. The whole plant, when wounded, yields a milky liquor, sweet when young, and which afterwards becomes acrid and caustic.

OF THE STYPTIC AGARIC (*AGARICUS STYPTICUS* OF BULLIARD).

Its general colour is that of cinnamon, more or less deep; its flesh is very soft, and tears with difficulty; its surface is dry; its stem is naked, full, a continuation of the pileus, somewhat compressed, and goes on expanding to its summit; it is from ten to fifteen millimetres in length; the pileus hemispherical, with the two extremities somewhat prolonged and rounded, and the edges rolled underneath; its great diameter is three centimetres at the most; the laminæ are straight, all of them entire, capable of being detached from the flesh, and remarkable for the manner in which they terminate, all of them at a circular line, beyond which none of them pass.

Paulet asserts, that this agaric, when given to animals, affects them much, and purges them, but does not kill them.

The *Pepper* and *milky Agarics* (*Agaricus Piperatus et Agaricus Lactifluus*) are also poisonous.

HISTORY OF SOME OTHER POISONOUS MUSHROOMS.

OF THE CROSS OF MALTA.

" Small bulbous Mushroom, pursed, stem straight, with a collar, rising to the height of three or four inches, of a pale flesh colour, something like that of veal, and having the pileus divided into five or six equal portions, bearing some sort of resemblance to a Maltese Cross. Its substance resembles more a real animal flesh, than the pulp of a Mushroom, not being covered with any skin, as almost all the other species are. This substance is cool, somewhat moist, of the same colour within as outside, and has the smell of the common Mushroom extremely exalted. The centre of the pileus is marked by a round button, a little elevated, and regularly circumscribed; its lobes are about two lines in thickness; its laminæ, which are almost all of equal length, and of the same colour as that of the under part of the pileus, are inserted circularly and radiating to a sort of tuft, without touching the stem. This stem, which is full of marrowy substance at first, empties itself in the end in a great measure, and becomes hollow. The collar and the purse are of a beautiful white." (PAULET, tom. ii. p. 316.)

M. Paulet ate about the half of one of these Mushrooms: in a short time he experienced a great degree of debility, and lost his senses. Half an hour after, a considerable quantity of vinegar was administered to him, and he recovered the use of his senses; he immediately swallowed some emetic tartar, and vomited the Mushroom; he had nevertheless, for several days, a looseness, weakness of the stomach, and severe gripings.

OF THE RAVEN'S EYE (*FUNGUS MINIMUS TOTUS NIGER UMBILICATUS* OF VAILLANT).

" Flesh white, tinged a little with the colour of the outside, its laminæ are of a jet black, and shine like that substance, compressed, and tender, of about two lines in height, having in their intervals small portions of laminæ placed by the side of the edges of the pileus, and uniting around the stem without adhering to it. The stem is straight, cylindrical, hollow, from the marrow being exhausted, and about three lines in diameter. It is found in the *Nivernois*." (PAULET, tom. ii. p. 196.)

OBSERVATION.

" A young vine-dresser, having some bread with a little butter for his afternoon repast, thought proper to cook this Mushroom with his butter, and ate it. A few hours afterwards, he complained of a swelling at the stomach, and very severe pains of the bowels. A great quantity of warm water was given him to drink, with emollient glysters, which afforded no relief. In the middle of the night he was found with the mouth closed, the eyes sparkling, a hideous aspect, and in a state of spasm and immobility similar to a catalepsy. He was bled in the foot, and made to take six drops of the *lilium* of *Paracelsus*, which recovered him a little; but he was extremely ill the whole night. The next day, he was copiously evacuated downwards by means of a strong dose of stibiated tartar, combined with tartrate of potash; but at three in the afternoon, he spit up blood in great abundance, and, a moment after, vomited a portion of the Mushroom, which was black and unaltered. At five, he vomited another portion. The symptoms subsided; nevertheless, the patient experienced a fever, which appeared to be of a putrid nature, and which

continued fourteen days." (*Lettre de M. Varnier, à M. Paulet*, op. citat. p. 197, tom. ii.)

OF THE MEDUSA'S HEAD (*AMANITA FASCICULOSA PILEIS RUFO-FUSCIS* OF DILLEN).

" It grows in a tuft, at the foot of oak-trees, sometimes to the number of thirty, united by their base, at first of a dirty yellow colour, afterwards of a clearer red. It rises to the height of from four to six inches, and bears *pilei* which do not exceed an inch and half in extent. These heads, or *pilei*, which at first have the appearance of brown crusts, especially in the centre, have their laminæ covered at their first appearance with a veil, which is white, thick, firm, giving them a globular form, and which bursts in the end to become converted into a collar; these heads terminate, by assuming the form of a cap. The gills, at first as white as the veil, are intermixed with small portions of laminæ, and adhere strongly to the stem, where they terminate by fine ribs confounding them with its substance, and finish by acquiring a reddish tinge, as does also the veil. The stems, which are swelled out a little from the bottom, are cylindrical, and of four or five lines in diameter, tinged with the colour of the top of the pileus, and full of a filamentous substance." (PAULET, tom. ii. p. 304.)

At six in the evening, a dog of middle size was made to take a certain quantity of this Mushroom; the animal moaned the whole night, and died twelve hours after the ingestion of the poisonous substance. The œsophagus was lined with a white and glairy mucus; the stomach wrinkled and inflamed; the intestinal canal was in the same state; its coats, which were increased about half a line in thickness, were full of a brown liquor, of the same colour as the Mushroom.

OF THE IVORY WHITE.

" A small Mushroom of a shining white like ivory, surface dry, very pleasing to the sight, which is found in Autumn, especially in the Park of *Saint Maur*. Its laminæ, which are unequal, and finely radiated, end for the most part as if by ribs implanted upon the stem. This stem, which is full, and which may be about two inches high, with three lines of diameter, is neither straight nor cylindrical; it is somewhat flattened, and grooved from the top. The pileus is grooved in the middle, and its edges are accommodated to that form." (PAULET, tom. ii. p. 153.)

One of these Mushrooms administered to a dog, produced at the end of three hours copious evacuations upwards and downwards; the animal refused food, and appeared greatly dejected.

OF THE REDDISH POINTED MILKY MUSHROOM (*FUNGUS PARVUS PIPERATUS LACTEUM SUCCUM FUNDENS* OF MICHELI).

Pileus, with the centre elevated to an acute point. This point is at length destroyed to make room for a cavity, a thing which generally happens to all the Mushrooms that are acrid and milky. This one is white; but its flesh, which is at first white, reddens with the contact of the air, as does the juice which it gives out when cut, which from the white colour it exhibits at first, becomes shortly of a beautiful carmine red: this juice is acrid and burning. Its laminæ, which are white, and increase in thickness towards their base, are of unequal length. The stem, which is a continuation of the substance of the pileus, is cylindrical, and full of a marrowy substance.

M. Picco having given some of this Mushroom hashed up

with meat to a dog, the animal died of gangrene at the end of twelve hours.

OF THE *EYE* OF THE OLIVE-TREE (*FUNGUS PERNICIOSUS INTENSE AUREUS* OF MICHELI).

It grows in tufts, at the foot of the olive-tree. The colour of the top of the pileus is a deep yellow, and becomes in the end olive; its laminæ are of a dirty or deep yellow. The whole plant assumes nearly the shape of a whip, and has as it were ear-shaped lobes. The colour of its substance partakes of the yellow colour which predominates; its flesh is not firm and brittle, but somewhat soft; its surface is dry, soft to the touch like velvet; its laminæ are elevated, a little separated from one another, and of unequal length. It has no disagreeable taste or smell.

The *green oak-ear* ought also seemingly to be suspected.

OF THE HOLLOW AND POISONOUS FUNNEL (*FUNGUS INFUNDIBULUM REFERENS ALBUS* OF BUXBAUM).

The animals who eat of this Fungus, are incommoded in a very sensible manner; they quickly throw it up by vomiting, and are greatly dejected in consequence of it.

OF THE *GREAT MUSTARD POT.*

A dog was made to take one of these Mushrooms; two hours after, the animal threw it up by vomiting.

Another species of this kind, designated by the name of *Terebinthine,* produced the same effects on another dog.

956. We shall proceed, however, to relate some observations of poisoning resulting from the ingestion of a mixture of two or three species of poisonous Mushrooms.

Observations.

1st. A farmer went on a Sunday to take a walk in a wood near his house, accompanied by his wife, who was three months advanced in pregnancy, and three of his children, aged, one five years and a half, the other four, the third two years: they perceived some Mushrooms of different species; they gathered them without choice, and returning home, served them up and ate them. In the course of the following night, the wife felt some uneasiness, and an oppressive pain in the epigastric region: all of them, during the Monday, experienced a sensation of suffocation, and of cardialgia, and frequent nauseas, which in the father were the same day succeeded by vomitings. On the Tuesday, the symptoms were more severe, with the addition of new ones; continual nauseas, vomiting of bilious matter, respiration more difficult, pains throughout the whole extent of the abdomen, but most sensible in the epigastric region; tenesmus, difficulty of making water. Two of the children died in the course of this night, and the third the next day. From the Wednesday to the Friday evening, the mischief continued to increase in the father and mother; the following symptoms were observed; intolerable pains of the stomach, towards the hypochondria, the loins, and the region of the bladder; inflation of the belly, difficulty in making water increased, tenesmus more painful, glairy and bloody evacuations upwards and downwards; cephalalgia, dry tongue, unquenchable thirst, anguish, convulsive motions of the extremities; in the father, nasal hæmorrhage.

On Friday evening, œdematous swelling of the articulations of the hands and feet in the woman only; in the husband, shiverings preceding gangrene of the intestines.

On the Saturday, the following phenomena: in the husband, chapped lips, aphthæ, inflammatory redness of the tongue and fauces, singultus, syncope, depression and intermission of the pulse, delirium, suppression of urine, and of the alvine ex-

cretion, icy coldness of the extremities, universal cold sweat, death. On the same day, in the wife, convulsive movements were already observed in the extremities. Copious emollient and antispasmodic drinks, and an oily sedative draught, caused her to throw up during the day, several shapeless portions of the Mushrooms. In the evening, the vomiting was less frequent, the urine began to flow, she passed a glutinous and fetid stool, the convulsive movements of the extremities ceased in the course of the night. On the Sunday morning, the gripings were less severe, the inflation of the belly was diminished. Four days after, the symptoms had nearly ceased; there remained a great degree of debility, a swelling of the inferior extremities only, trembling of all the extremities, fixed pain above the right orbit. Her convalescence was tedious; however, three months after, she recovered her flesh, and felt very distinctly the movements of her infant."*

2nd. The wife of a physician tasted inadvertently a piece of dried Mushroom; she chewed it, immediately spit it out, and rinced her mouth. Half an hour after, she experienced great uneasiness, shiverings, retchings, inclinations to vomit, accompanied with useless efforts, and a very painful sensation of the stomach. Some time after, she was affected with continual vomitings, paleness, cold sweats, the eyes almost resembling those of a dying person, pulse extremely low and small. (*Journal Général de Médecine*, tom. xxvi. p. 265.)

3rd. *M. Dufour*, a physician of *Montargis*, gathered in the neighbouring forest some fresh and wholesome Mushrooms, known (in French) under the common names of *Cepe*, *Columelle*, and *Oronge*: they were stripped of their skin and their stem, cut into slices, and cooked in their juice with butter and fine herbs, under a camp oven: they were served up at table. The servant girl, aged twenty years, who had eaten the greatest quantity, very shortly complained of con-

* *Journal Général de Médecine*, tom. xxv. p. 241.

fusions of the head, giddiness, and a slight heaving of the stomach; her face was red and inflamed, the eyes starting and lively, the pulse large, undulating, and full. The eldest daughter of M. Dufour, aged twelve years, experienced the same symptoms without any nausea. A little child, eighteen months old, that had only eaten some bread dipped in the gravy, slept quietly for sixteen hours, contrary to his usual custom, and exhibited no other remarkable phenomenon. The other child, aged eleven years, complained of confusion of the head, and intoxication: the parents did not experience the least inconvenience, although they had partaken of the same dish. M. Dufour administered to all the patients emetic tartar, plentifully diluted, and endeavoured to excite the evacuations sympathetically, by making all of them vomit into a large earthen vessel. An antispasmodic draught with a large dose of ether was next employed, and the cure was completed by the evening. It appears that these accidents were owing to two Mushrooms of the *Agaricus Muscarius* of Lin. which had been confounded with the proper ones, and entered into the composition of the dish."*

4th. The same physician was requested to visit a child of nine or ten years old, that had been ill four days, and had been brought out of the forest of Montargis; it was thought to have been poisoned by some Mushrooms. He was in the following condition: deadly paleness; covered with sweat, clammy, and cold as ice; the eyes half open, discovering only the opaque cornea; the pupils immovable, and insensible to the impression of light; stiffness of the whole body, or rather a universal straight tetanus; the abdominal muscles in the utmost state of spasmodic constriction; the belly flattened, and hard as a board; trismus, or invincible spasm of the jaws; the pulse was gone, and the movements of the heart scarcely perceptible. The child might have been supposed

* *Gazette de Santé*, 21st August, 1812.

dead, had not the extremities and thorax been agitated by some convulsive movements. M. Dufour broke two of the fore-teeth with a pair of scissars, and administered, by means of a small tin spoon bent into a spout, a mixture of equal parts of sulphuric ether and orange-flower syrup; the body was enveloped with leaves of tansy, nightshade, dulcamara, and jessamine; frictions were employed on the abdomen, with a mixture of oil of chamomile, camphor, alkohol, and ammonia. Every means were had recourse to in order to restore heat to the patient. Deglutition, which was at first difficult, shortly became free; the child opened his eyes, then the mouth, and was restored in the course of a few hours, after having swallowed an ounce of ether, and as much syrup. It was soon determined that there were among the Mushrooms of the wood, the *Amanita Viridis* of *Persoon*, the *Hypophyllum Virosum* of *Paulet*, the *Hemlock-Mushroom*, and other poisonous species. (*Gazette de Santé*, 1st November, 1812.)

5th. *Lemonnier* opened the body of a young person who had been poisoned by Mushrooms. He found the portion of the stomach contiguous to the pylorus inflamed, the duodenum distended with blood; its interior membrane was slightly spotted, and exhibited here and there small excoriations: its inferior part was drawn up. (ALIBERT, op. citat. tom. i. p. 462, 3rd Edition.)

957. Having thus described the facts relating to the poisoning by the different species of Mushrooms, we may give a general description of the symptoms to which they most frequently give rise. An excellent report on this subject has been made to the Society of Medicine of Bourdeaux.

" Pains of the stomach," says the document, " gripes, nausea, evacuations upwards and downwards, are the first symptoms with which the patients are attacked. Shortly after, heat of the bowels, faintings; the pains become more continued and violent; cramps, convulsions, sometimes general, sometimes

partial, unquenchable thirst, succeed: the pulse is small, hard, tight, and very frequent. When the symptoms, after having lasted a certain time, do not diminish in consequence of the relief afforded, vertigoes, a stupid delirium, and drowsiness, affect some subjects, and are only interrupted by the pains and convulsions. In others, there is no drowsiness; the pains and convulsions exhaust the strength; faintings and cold sweats come on; death puts a period to this series of sufferings, after having been foreseen and announced by the patient himself, who has not lost his senses for a single moment.

" The poisonous Mushrooms do not manifest their pernicious action till a certain time after they have been eaten; most commonly from five to seven hours after. Twelve or sixteen sometimes elapse, more rarely four and twenty, before any symptoms are felt. The serious alterations in all the viscera prove, that this poison, having acquired all its energy by the means of digestion, extends itself over the whole animal economy, excites the most violent irritation, and an inflammation which quickly degenerates into gangrene, which takes place with a greater degree of intensity in the digestive passages, which have immediately received the poison, and which preserve the remains of it in a state of solution during a longer time."*

958. In collecting the different phenomena exhibited in the bodies after death by this kind of poisoning, they may be reduced to the following: " Violet-coloured spots over the integuments, very extensive and numerous; abdomen extremely bulky; the conjunctive as it were injected; the pupil contracted; stomach and intestines inflamed, and scattered over with gangrenous spots; sphacelus in some portions of this viscus; very strong contractions of the stomach and intestines; so much so, that, in these latter, the thickened membranes had almost obliterated the canal; the œsophagus in one of the sub-

* *Rapport du* 26 Juin, 1809.

jects was inflamed and gangrened; in another, there was an intus-susception of the *Ileum* from above downwards, for the space of three inches; one single person had the intestines distended with excrementitious matter. In none have any remains of the Mushroom been found: they had been either completely digested, or evacuated. The lungs were inflamed and distended with black blood; the same congestion had taken place in almost all the veins of the abdominal viscera, in the liver, spleen, and mesentery; inflammatory and gangrenous spots on the membranes of the brain, in its ventricles, on the pleura, lungs, diaphragm, mesentery, bladder, uterus, and even on the fœtus of a pregnant woman; the blood in this subject was extremely fluid; in other persons it was almost coagulated; the extreme flexibility of the limbs was not a constant appearance."*

959. The preceding facts allow us to conclude, that Mushrooms act in a different manner according to the species to which they belong.

Zeviani says, in a dissertation on poisonous Mushrooms, *Il solo veleno dei funghi contiene il se la malizia di tutti, e vari moltiplici effetti produce secondo che è in maggior copia ingollato, ed in maggior copia dentro le vene s'intrude.*

INDICATIONS WHICH SHOULD EXCITE A SUSPICION OF MUSHROOMS.

960. All those growing in moist and marshy grounds, in the shade, that is to say in thick forests, where the influence of the solar rays has scarcely any access, ought to be rejected as of very bad quality: the substance of these Mushrooms is softer, less tight, more porous, and contains a great deal of moisture. They have generally an ugly look, and exhibit a surface more or less dirty. *Paulet* observes, that the exist-

* *Rapport, cit.* p. 10.

ence of a glairy coat, which covers the surface of certain species, is no indication of a suspicious quality; but then they ought not to be regarded as good, only when they unite with that state, all the qualities of those which are eatable; for all the Mushrooms with a moist surface, which are dull looking, or which change colour when cut, or which have the virulent smell very strong, or are of a bright colour, or of several distinct colours, especially if they come out of an envelope, and are found in the shade, ought to be rejected as of a bad quality. The same may be said of such as the insects have bitten, and afterwards have quitted. We ought also to regard as pernicious all those which have bulbous and soft stems, or which have fragments of skin glued to their surface. All those must likewise be rejected which grow rapidly, and corrupt very quickly. It has long been an opinion, that Mushrooms when dried, lose their deleterious properties; this fact, which may be true for some of the species enumerated, is not so for the whole, for the agaric preserved with pepper retains its acrimony; beside, we have seen that the wife of a physician was poisoned in consequence of having eaten a piece of dried Mushroom.

ACTION OF ALKOHOL ON THE ANIMAL ECONOMY.

Experiment 1st. Two drachms of Alkohol were introduced into the stomach of a cat. Immediately after, the animal agitated itself violently, then lay down on the side in a state of great insensibility, and without motion; the breathing became laborious and sterterous, and the pulsations of the heart were accelerated. This situation continued eight minutes; then the breathing became less difficult; the animal rose up, and was able to walk about.

Experiment 2nd. An ounce and half of the same fluid was injected into the stomach of a very large rabbit. The

same symptoms followed, and did not disappear till after forty minutes.

Experiment 3rd. The same experiment was repeated upon a rabbit much younger, with seven drachms of the same fluid. At the end of two minutes, the animal was evidently under the influence of the poison, and three minutes after, he lay down on the side in a state of great insensibility, and motionless; the pupils were extremely dilated; from time to time the limbs were agitated with slight convulsive movements; the breathing was performed in a painful manner, and ceased altogether an hour and fifteen minutes after the ingestion of the Alkohol. At the end of two minutes more, the animal appeared to be dead. The thorax was opened, and it was perceived that the heart was contracting with tolerable force and frequency, and that it contained blood of a dark colour. A tube was introduced into the trachea, and some air was blown in: by this means the natural appearance could be preserved to the pulsations of the heart, the same as in an animal from which the head has been removed.

Experiment 4th. Two ounces of the same fluid were injected into the stomach of a rabbit. The injection was scarcely finished, when the animal became insensible. The same symptoms were observed as described in the preceding experiment, and death took place twenty-seven minutes after the introduction of the poisonous substance: on examining the thorax, the heart was found to be contracting. (BRODIE, *Philosoph. Trans.* year 1811, p. 176, 1st Part.)

Experiment 5th. At half past eight in the morning, we introduced into the stomach of a small robust dog six drachms of Alkohol, at 40°: the œsophagus was then tied. Immediately after, the animal appeared to be agitated, he ran over the laboratory in different directions, and did not cease to walk at his ease for ten minutes: he had a wild appearance. At three quarters past eight, he began to experience vertigoes. At ten minutes after nine, he lay down on the side, and was

no longer able to stand. Till this moment he had walked about in different directions, and fell down several times, but rose immediately; his limbs had not been paralyzed. At twenty-five minutes after nine, he uttered plaintive cries, and made some unsuccessful attempts to lift up his head; the limbs were pliable, the pupil contracted; he both heard and saw very well; his muscles were not agitated by any convulsive movement. Ten minutes after, his cries became acute. At forty minutes after nine, he tried to get up on his feet, but fell down again immediately, striking the ground with his head; a few moments after, he made fresh efforts, rose up, walked for a few seconds, and fell down, uttering acute cries. At eleven, he was lying on the side, and continued to suffer; no convulsive movement. He died at half past eleven. He was opened at two. The blood contained in the heart was black and coagulated; the lungs did not exhibit any alteration; the mucous membrane of the stomach was of a cherry-red colour throughout its whole extent, and presented a very great number of longitudinal bands of a blackish red, formed by extravasated blood between the two coats.

Experiment 6th. When eight or ten grains of Alkohol, at 40°, are injected into the cellular texture of the thigh of a dog of middle size, it is observed, that the animal is agitated; for thirty or forty minutes, he walks about in all directions, with a wild aspect, and experiences no giddiness; then the posterior extremities become feeble; his walk becomes staggering; he vomits, at two or three different times, yellowish bilious matter. Fifteen or twenty minutes after, the vertigoes are more violent; the animal walks about as if mad, falls down, gets up again, and continues running over the laboratory. In a short time after, he experiences great difficulty in getting up on his legs, and agitates them as if he were swimming. These efforts soon become fruitless: then he lies down on the side, in a state of great insensibility; the limbs are pliable, and exhibit no convulsive movement; the animal utters no moan,

except when shaken; the breathing is deep; the pupils in their natural state. These symptoms continue during two or three hours, and the animal dies. On opening the body immediately after, no lesion is discovered in the wound; the Alkohol is found completely absorbed; the heart, and the veins of the limb operated upon, contain black coagulated blood; not the least contractions are observed in these organs; the lungs and digestive canal exhibit no alteration.

If the quantity of Alkohol applied to the cellular texture be less, the animals experience those symptoms of excitement which we have mentioned; they labour under slight vertigoes, and quickly recover.

Experiment 7th. We have proved, p. 425, vol. i. part 2nd. that Alkohol produces a sudden death when injected into the jugular vein, and that it acts principally by coagulating the blood.

961. Let us compare with these facts the phenomena produced by spirituous liquors on the human species, when taken in a sufficient quantity to produce intoxication. *M. Garnier*, my pupil, who has sustained an excellent inaugural thesis on this subject, distinguishes three different degrees of intoxication.

The first degree is announced by redness of the face; the eyes become animated, the countenance expands, and exhibits a pleasant cheerfulness and joy; the mind is more free, more lively; the ideas flow more easily, cares disappear, they are replaced by wit, by soft overflowings, and tender declarations of friendship; those under its influence talk much; are indiscreet; their conversation becomes somewhat prolix, and they begin to faulter already in their speech.

The second degree of drunkenness is characterized by a noisy turbulent mirth, by immoderate fits of laughter, senseless discourse, obscene songs, brutal actions, according to the peculiar temperament of the individual; by a staggering, uncertain step, similar to that of children; by unnecessary tears,

confusion of the senses, double vision, eyes haggard and melancholy, and *tinnitus* of the ears; the tongue with difficulty articulates sounds; there is sometimes a foaming at the mouth; the judgment becomes false, the reason disappears, the grosser appetites and inclinations are no longer under control: sometimes a furious delirium comes on; the pulse is more expanded; the beating of the carotid arteries more sensible; the face is red and bloated, the veins of the neck distended, respiration hurried; the breath exhales the smell of the liquor. To these are added acrid eructations, inclination to vomit, vertigoes, falls threatening, at length complete: the drowsiness and state of vertigo increase; the countenance becomes pale and cadaverous; the features are sunk in; copious vomitings of acid matter; sometimes involuntary passage of fæces and urine take place, as well as a violent head-ache and total loss of senses; at length a profound sleep, which lasts several hours, during which the perspiration is very copious, puts an end to this painful condition. The functions return by degrees to their original state; the head still continues painful and heavy; the tongue is foul, the mouth clammy; the patient is thirsty, and there remains a loathing of all food, and lassitude of the whole body.

The third degree of drunkenness is a state truly apoplectic: an abolition of the senses and understanding is observed; the countenance is livid or pale; the breathing sterterous; the patient is no longer capable of supporting himself; the mouth is full of foam, coma comes on, and sensation is more or less completely destroyed. This state may continue for three or four days, and terminate in death. *Morgagni* makes mention of a man of advanced age, who remained in a state of intoxication with aphonia during three days, and died on the fourth without having experienced any convulsions.*

962. The preceding facts allow us to conclude,

* *Liber* i. *Epist. Anat. Med.* xix. art. 55.

1st. That Alkohol exerts the same action on dogs, cats, and rabbits, as on the human species;

2nd. That it acts with less energy when injected into the cellular texture, than when introduced into the stomach; but that it is still more active when injected into the jugular vein;

3rd. That it begins by determining a strong excitement of the brain, to which succeed coma and insensibility;

4th. That its first effects are the result of the action which it exerts on the nervous extremities, and which is propagated to the brain; it is however absorbed in the end;

5th. That there is no identity, as is pretended, between its action, and that of opium. In fact, *A.* Opium acts after being absorbed; therefore it is much more active when injected into the cellular texture of the thigh, than when introduced into the stomach, because, in the first instance, the absorption is more energetic; Alkohol, on the contrary, acting on the nervous extremities, must necessarily produce phenomena more rapid and intense in the stomach, than when applied to the thigh. *B.* Alkohol constantly produces, on men and on dogs, an excitement, the duration of which is various, and which is followed by a state of coma and great insensibility; opium, on the contrary, begins by producing a drowsiness, always accompanied by paralysis of the posterior extremities, and which is quickly followed by convulsive phenomena of the most horrible kind, so that the animals in the end are in a state of real excitement. *C.* Opium does not inflame the texture of the stomach; Alkohol, on the contrary, produces there a considerable degree of phlogosis.

We may be convinced of the difference which exists between these two poisons, by injecting into the cellular texture of the inside of the thigh of two dogs, of about the same degree of strength, thirty-three, or thirty-six grains of the watery extract of opium, dissolved in two or three drachms of water, and ten or twelve drachms of Alkohol at 40°; these doses will produce death in the course of about four or five hours.

963. *M. Brodie* is likewise of opinion, that Alkohol is not absorbed, and that it acts sympathetically on the brain by means of the nerves of the stomach. The following are the facts on which he rests this assertion. 1st. The animals which die after having taken Alkohol, exhibit a decided inflammation of the stomach; 2nd. The effects produced by this fluid are so instantaneous, that it appears impossible that absorption can have had time to effect it; 3rd. A person intoxicated is frequently restored by vomiting; 4th. When Alkohol is introduced into the stomach, combined with tincture of rhubarb, and the urine is examined after death, the tincture cannot be perceived; whilst, on the other hand, when this latter is absorbed and carried into the circulation, it may be found in the urine, by adding to it a little potash, as has been proved by *M. M. Home* and *Brande*.

M. Brodie compares the action exerted by Alkohol on the brain, to that produced by the concussion or compression of that organ. In fact, these mechanical injuries induce a loss of movement, insensibility, dilatation of the pupils; the breathing becomes difficult and sterterous, ceases altogether, and the patient dies. (*Paper before quoted*, p. 182.)

OF SULPHURIC ETHER.

Experiment 1st. At eight in the morning, half an ounce of sulphuric Ether was introduced into the stomach of a small robust dog, and the œsophagus was tied. Two minutes after, the animal made efforts to vomit, which were renewed a few moments after. At the expiration of five minutes, he experienced vertigoes, which in a short time became very violent. At ten minutes after eight, he was no longer able to stand; all the muscles appeared to have lost their contractile force; he exhibited no convulsive movement, and the organs of sense possessed their full powers; from time to time, he rested his head upon the ground, and made fruitless efforts to

raise it up; the breathing was difficult and accelerated. At sixteen minutes after eight, he uttered plaintive cries, and attempted again to vomit. A few moments after, he ceased to moan, and fell into a state of great insensibility; his limbs were extremely pliable. At forty-five minutes after eight, he began to moan again, and seemed much less drowsy; he turned himself in different directions in order to get up, but could not accomplish it in less than five minutes; his posterior extremities were not paralyzed, but he was troubled with a giddiness, which caused him to stagger; the breathing continued to be difficult and accelerated. At nine, he fell down again, and sunk into a state of great insensibility. He died at eleven. At half past twelve he was opened. The stomach contained a small quantity of a viscid brownish fluid; its mucous membrane presented, throughout its whole extent, a blackish red colour; it was strongly inflamed; the other coats of this viscus were of a bright red; the interior membrane of the duodenum was somewhat inflamed: the rest of the digestive canal was sound; the blood contained in the heart was black, and partly fluid, partly coagulated; the lungs were distended with fluid blood.

Experiment 2nd. At eight in the morning, three drachms and a half of sulphuric Ether were injected into the cellular texture of the inside of the thigh of a small weak dog. At nine, the animal had not presented any remarkable phenomenon. At eight in the evening, he uttered plaintive cries, which were frequently repeated during the night; he staggered in walking. The next day, he was somewhat dejected. This state continued till the end of the fourth day, when he died.

OF CARBONIC ACID GAS.

964. Carbonic Acid Gas is invisible, endued with a taste slightly acidulous, and a pungent smell; its specific gravity is, as 1,5196; it quenches bodies in a state of combustion,

reddens the infusion of tournesol, dissolves in water, and gives a white precipitate with the waters of lime, barytes, and strontian. It is found in the atmospheric air, and in certain grottoes in volcanic countries; it is disengaged from lime-kilns, and from vessels containing liquors in a state of fermentation.

ACTION OF CARBONIC ACID GAS ON THE ANIMAL ECONOMY.

965. The experiments made by *M. Hallé* prove, that animals are brought into a state of asphyxia by this gas, in the space of two minutes.

"In the month of April, 1806, a family of seven persons were reduced to a state of asphyxia at Marseilles, outside the *Barrière Saint Victor,* by the vapour of a charcoal-stove, which they were burning clandestinely in the yard of the house, the vapour introducing itself by the door and windows. Of these seven persons, five died, and two were saved: they all endeavoured to escape death, by deserting the house; and as it was in the night that the accident happened, they were found upon the stairs, and at the threshold of the door, having a lamp with them, and in the attitude of flight: but the deleterious gas had deprived them of the strength and the means." (FODERE, *Médecine Légale,* tom. iv. p. 37.) The same author mentions, having seen waters impregnated with Carbonic Acid Gas produce giddiness, and dimness of sight.

The alterations discoverable by dissection of bodies killed by this gas, are the same as those produced by the gaseous oxyde of carbon, except that the blood is not so black.

M. Nysten has proved, 1st. That it may be injected in tolerable quantities into the venous system, without stopping the circulation; that it does not act primitively upon the brain; and that when a much greater quantity is injected than the blood is capable of dissolving, it produces a distension of this

organ, and death; 2nd. That when injected with caution, it produces only a muscular debility, which ceases in a few days; 3rd. That it may be injected in a stronger dose without producing any pulmonary lesion; 4th. That it turns the arterial blood brown, but in a less degree than the gaseous oxyde of carbon; 5th. That it may be injected in small quantity into the carotid artery, without producing any notable symptom; that when injected in greater quantity, it produces apoplexy, which appears to be owing to the distension beyond measure of the capillary system of the cerebral pulp; 6th. That it ought not to be regarded as deleterious *per se*.

OF THE GASES WHICH ARE DISENGAGED DURING THE COMBUSTION OF CHARCOAL.

966. These gases may be considered as formed of a great quantity of Gaseous Oxyde of Carbon, and a little Carbonated Hydrogen Gas. It is evident, that they only contain some particles of Carbonic Acid Gas; for this latter is decomposed by the red hot charcoal, and converted into Gaseous Oxyde of Carbon.

Characters of the Gaseous Oxyde of Carbon. It is invisible, transparent, elastic, insipid, producing no action on the infusion of tournesol, and lighter than atmospheric air; its specific gravity is, as 0,96783. When a lighted taper is applied to the mouth of a bell filled with this gas, and exposed to the atmospheric air, it absorbs its oxygen, burns with a blue flame, and becomes changed into Carbonic Acid Gas; in like manner lime-water, being poured into the bell after the combustion, becomes turbid, and carbonate of lime is precipitated. When mixed with equal parts of *Gaseous Chlorine*, and exposed to the sun, it becomes converted into a gaseous product, discovered by *M. John Davy*, the specific gravity of which is, as 3,4269, and which strongly reddens the infusion of tournesol. The Gaseous Oxyde of Carbon is

not sensibly soluble in water. It is composed of forty-three parts of carbon, and fifty-seven of oxygen.

967. It results from the experiments made by *M. Nysten* upon dogs, 1st. That the Gaseous Oxyde of Carbon produces, by its mechanical action, when injected into the veins, much more disturbance, *cæteris paribus*, in the circulation and respiration than the Carbonic Acid; that the pains which it occasions appear to be disproportioned to those which a body, whose action depended only on its gaseous form, such as the atmospheric air, would give rise to: which induces a belief, that it possesses a peculiar influence over the nervous system; 2nd. That it acts more particularly, when respired, by opposing an obstacle to the chemical phenomena of respiration, and that it ought not to be regarded as deleterious *per se;* 3rd. That it turns the arterial blood very brown; 4th. That after the cessation of the symptoms resulting from its mechanical action, it leaves behind a disturbance in the functions of animal life, which appears to be dangerous, but which speedily subsides; 5th. That it may be injected in a tolerably strong dose without producing any pulmonary lesions.

The experiments of *M. Nysten* on the *Carbonated Hydrogen Gas* prove, 1st. That when injected into the veins in sufficient quantity to produce distension of the heart, it occasions death, in a manner purely mechanical; 2nd. That it gives rise to no pulmonary lesion; 3rd. That it imparts a little brown colour to the arterial blood; 4th. That when respired, it occasions death, by obstructing the chemical phenomena of respiration, and, consequently, that it is not deleterious *per se.*

968. After having examined singly the gases which are disengaged during the combustion of charcoal, we may proceed to detail the principal phenomena observed in persons asphyxied by the vapours of this combustible body. The general symptoms of this species of poisoning are, a great heaviness of the head, intolerable *Tinnitus Aurium*, disturbed vision, a great propensity to sleep, diminution of strength, and falling down;

sometimes an inexpressible pleasure, which induces the person to remain exposed to this destructive vapour;* at other times violent head-aches, a great difficulty of breathing, which becomes sterterous; violent palpitations of the heart, which are shortly followed by a suspension of the respiration, circulation, voluntary movements, and the functions of the organs of sense, a profound coma, and state of apparent death, in which condition the limbs are sometimes flexible, at other times stiff and bent; the heat is the same as before the accident, and continues a long time in that state; the countenance is sometimes red and livid, its blood-vessels are very much swelled; at other times it is pale, and of a lead colour; sometimes, also the sphincters become relaxed, whence results an involuntary discharge of urine and fæces. The temperament of the person asphyxied has great influence in determining this or that symptom.

969. The dead bodies of such as have fallen victims to this kind of poisoning, preserve for a long time their heat; the lips are vermillion, and their limbs extremely flexible: the veins, especially those of the lungs and brain, are distended with black fluid blood, which flows with very great facility; the arteries are nearly empty; the face is bloated, and more red than ordinary; the rest of the body is likewise somewhat swelled, and frequently exhibits violet-coloured spots; the eyes are lively and shining; the membranes are reddish, and exhibit sometimes small *ecchymoses;* the lungs are, as it were emphysematous, the muscles softened, the stomach and in-

* *M. Favre* says, in a pamphlet entitled: *Instructions sur les Moyens à employer pour rappeler à la Vie les Personnes Asphyxiées*, printed at Brussels, in 1806: "*M. Terrade* has seen a man, who had been asphyxied by the vapour of charcoal, while sealing some bottles in his cellar, and whom he had recalled to life. This person assured him, that he felt his strength diminish by degrees; that the pleasure which he experienced had forced him in some measure to remain exposed to the action of the deleterious gases resulting from the combustion of charcoal, and that at the last he fell asleep." page 11.

testines reddish, the tongue tumefied; the epiglottis is always elevated.

OF SPURRED RYE *(SECALE CORNUTUM)*.

970. The spikes of certain grasses exhibit sometimes a vegetable production in the shape of a spur or horn, which bears the French name of *Ergot*, and which is most commonly seen on rye.

"The *Ergot*," says *M. Tessier*, "is a grain commonly curved and elongated, it protrudes greatly beyond the glume which serves for its calyx. Its two extremities, which are of less circumference than the middle part, are sometimes obtuse, sometimes pointed. It is very rarely rounded throughout its whole length, more frequently there are found three sharp pointed angles, and longitudinal lines extending from one end to the other. In many of the grains thus affected are seen small cavities, which might be taken for the bites of insects. The colour of the *Ergot* is not black, but violet, with different degrees of intensity. On the greatest number of the grains in question, are observed some whitish traces at one of the extremities; this is where the *Ergot* was adhering to the glume. The violet coloured bark of these grains covers a substance of a dirty white colour, and firm consistence, from which it is not separated even after long boiling. The grains thus affected easily burst, and they break clean, with a little noise like a dry almond. In the state of grain, the *Ergot* only possesses a disagreeable smell when fresh, or collected in great quantity; but if it be reduced to powder, this smell is more sensibly diffused: it then impresses upon the tongue a taste slightly pungent, and bordering on that of rotten corn. The *Ergot* cannot be confounded either with the carbuncle or the caries." *M. Tessier* is of opinion, that this disease of the rye depends on the poverty and the humidity of the soil, and probably on the influence of abundant rains.

(*Mémoire sur les Observations faites en Sologne par M. Tessier,* en 1777.) *Read* is of opinion, that the *Ergot* proceeds from the circumstance of the grain of the rye having been pierced, at the first moment of its appearance, by a species of butterfly, which has deposited in it a liquor capable of exciting a fermentation.*

ACTION OF THE SPURRED RYE UPON THE ANIMAL ECONOMY.

971. It has been remarked, that many persons who had eaten a small quantity of Rye in this state, experienced nervous symptoms, whilst those who had made use of it for a long time, or who had eaten a great quantity at once, were seized with a gangrenous affection. To these two diseases have been given the French names of *Ergotisme Convulsif,* and *Ergotisme Gangreneux.*

Ergotisme Convulsif. It is a well known fact, that the use of Rye in this state has given rise to epidemic diseases, which have laid waste certain cantons of Silesia, Prussia, Bohemia, Hesse, Lusatia, Saxony, and Sweden. Several authors of respectability having given descriptions of the symptoms most generally observed in these epidemics, we shall here extract what is most important to be known. *I. A. Srine,* who has described the effects produced by this poison in 1736, in the country of Wartemberg in Bohemia, says: " the disease begins with an uneasy sensation about the feet, which is a kind of tickling or formication; in a short time a severe cardialgia succeeds; the hands and head are soon after affected. The fingers beside are seized with so strong a contraction, that the most powerful man can scarcely master them, and the articulations appear to be luxated. The patients utter acute cries, and are devoured by a fire which burns their hands and feet. After the pains, the head feels heavy, the

* Read, *Traité du Siegle Ergoté,* in 12mo. Strasburg, 1771.

patient experiences giddiness, and the eyes become obscured by a thick mist, to such a degree, that some persons become blind, or see all objects double; the intellectual faculties are perverted; mania, melancholy, or coma take place, the giddiness increases, and the patient appears intoxicated. This mischief is accompanied with opisthotonos; the mouth is filled with foam almost bloody, or else yellow or green. The tongue is often lacerated by the violence of the convulsions: it swells sometimes to such a degree as to intercept the voice, and produce a copious secretion of saliva. Almost all those, who have been subject to epilectic symptoms, died; those, who after the formication of the limbs, become cold and stiff, have much less distension of the hands and feet. To these symptoms succeed a canine hunger, and it rarely occurs that the patients have any aversion to food. Out of five hundred persons attacked with this disease, only one had buboes in the neck, which furnished a yellow matter, and this patient was a prey to excruciating and burning pains. Another had the feet covered with spots like flea-bites, which did not disappear till after eight weeks. The faces of several of them were covered with this eruption. The pulse was the same as in health. To the spasms succeeded stiffness of the limbs. This disease continued two, four, eight, sometimes even twelve weeks, with some intervals of rest. Out of five hundred persons, three hundred children died." (*Saty. Medicor.* Siles. Specim. iii.)

Ergotisme Gangreneux. *Salerne* gave a small male pig, which had been already castrated, some barley, in which there was one third of *Ergot*. At the end of fifteen days, the legs of the animal became red, discharged a greenish and fetid humour; the under part of the belly and the back were of a black colour; the excretions were in their natural state. This kind of food was continued for a fortnight longer: then some pure bran boiled and still hot, was given to him. The animal at first appeared better; but he soon began again to

complain ; he could with difficulty support himself, and died, still preserving his appetite. The mesentery, jejunum, and ileum, were inflamed ; the edge of the liver exhibited two livid spots ; there were under the throat, and on the legs, some black pimples, which were a little open, and discharged a reddish humour ; there was no gangrene in the feet. Other experiments made by the same author, by *Read*, and by *Tessier*, presented the same results : the animals died with signs of gangrene in the tail, ears, feet, &c. ; and gangrenous spots were found in the liver and intestines.

The human species has likewise been attacked by this disease. Several authors have given detailed accounts of gangrenous epidemics, the cause of which was known to be ergotted rye, and the same symptoms have constantly been observed, as we have already described in speaking of animals.

Darnel, or *Rye-Grass*. (Lolium Temulentum.) 1st. *Seeger* gave to a dog three ounces of broth made with the flour of Darnel Grass and water. Five hours after, the animal experienced very violent tremblings, which lasted three hours ; he was no longer able to walk ; his eyes were fixed ; his breathing difficult. Nine hours after the ingestion of the fluid, he was in a deep sleep, and insensible ; nevertheless, the next day he was recovered. Other animals submitted to the same experiment, had violent vomitings and convulsions ; the perspiration and urine were increased.

2nd. Two peasants, their wives, and an old woman, ate together five pounds of oat-bread mixed with Darnel. Two hours after, they all complained of a heaviness of the head, accompanied with a pain, which appeared principally confined to the forehead. They experienced giddiness and *Tinnitus Aurium*, so that they thought to hear a continual noise of drums and kettle-drums : the tongue exhibited a very strong trembling : they could not swallow, nor pronounce one word distinctly : their breathing was impeded, the stomach very painful. They threw up a quantity of clear water, after hav-

ing made useless efforts to vomit. They had no appetite. They had frequently strong desires to make water, without, however, feeling any pain or other inconvenience from it: their whole body was trembling, covered with a cold sweat, and exhausted by lassitude. They fell, a few hours afterwards, into a state of somnolency. (SEEGER, Latin Dissertation on Darnel, *Tubingæ*, 1710.) According to this author, one of the most certain signs of poisoning by this plant, is a general trembling of the whole body.

Wheat. It sometimes happens that the farinaceous part of wheat becomes converted into a black powder, which imparts bad qualities to the bread. *M. Fodéré* affirms, that he has seen, in 1808, colics and diarrhœas, which arose from this cause. The blighted grains may also give rise to accidents.

Hippomane Mancinella (the Manchineel Tree). 1st. A Soldier of Piedmont, taken prisoner at the siege of Belgrade, was carried away a slave into Turkey. He perceived one day on the ground, whilst walking by the sea-side, a number of fruits, which he took for apples: he ate about two dozen of them, returned home after having filled his pockets, and still continued to eat them. An hour after, his belly swelled greatly, and he felt an extreme degree of heat in the intestines. He could no longer stand. These symptoms went on increasing; the lips were ulcerated by the milky juice of the fruit, and he experienced cold sweats. He was made to take in great abundance a watery decoction of the leaves of a species of *Ricinus (Avellana Purgatrix);* he vomited, and was purged for four hours. These distressing symptoms disappeared by degrees. They then gave him rice, and he became easy to that degree, that, twenty hours after, he felt no more pain, and the bulk of the belly was remarkably diminished.*

2nd. The same author adds, that the savages poison their arrows with the juice of the Manchineel, which renders their

* *Philosophical Transactions, singular Observation, &c. by Peyssonnel,* anno 1758, p. 772.

wounds mortal: that the rain which falls from the leaves and branches, raises blisters like boiling oil; that the shade of the tree causes those to swell who repose under it; (this fact is called in question by Jacquin). He says, that a woman with child was mad enough to eat three of these apples, which did her very little harm: this was looked upon as a miracle, and a proof of the surprizing effects of the imagination on pregnant women.

3rd. The missionaries who have written on the Natural History of America, assert that the malignant vapour which exhales from the Manchineel Tree when cut, kills the workmen who attempt to work at it. *M. Castera* was witness, that a negro had his hands and face swelled and burned in consequence of having cleft a small branch of it. (FODERE, tom. iv. p. 38.)

Mercurialis Perennis. (Mountain Mercury.) This plant is hurtful to sheep and to the human species. It has produced, in different persons who have eaten it, violent vomitings, excessive diarrhœa, a burning heat in the head, profound sleep, and convulsions, which, in one instance, were followed soon after by death. (VICAT, op. citat. p. 215.) *Hans Sloane* asserts, that it possesses a narcotic and fatal malignity. *Bomare* is of opinion, that it produces effects similar to those of the *Palma Christi.*

Chærophyllum Sylvestre. (Wild Chervil.) It is said that the root of this plant, gathered in winter, has produced delirium, a very profound sleep, numbness, and suffocation, which however have not been followed by death. It is asserted also, that the seeds and root of the *Chærophyllum Bulbosum* have excited vertigoes and pains of the head. *Plenck* affirms, that he has often eaten it without any inconvenience. (Op. citat. p. 126.) The *Chærophyllum Temulentum* appears also to produce intoxication.

Sium Latifolium. Beyerstern assures us, that the root of this plant, gathered in the month of August, has produced

furious delirium in children and cattle. Some of them have even died of it. It does not appear hurtful when eaten before the middle of the summer. The leaves are not mischievous.

Coriaria Myrtifolia. *Sauvages* relates, that a child, ten years of age, and a labourer, forty years old, died amidst the most horrible convulsions, half an hour after having eaten some of the berries of this plant. (*Histoire de l'Académie Royale des Sciences*, 1739, p. 473.)

OF THE EFFECTS OF ODORIFEROUS PLANTS ON THE ANIMAL ECONOMY.

972. Amongst the plants which we have hitherto spoken of, there are a great number, the flowers of which, more particularly, diffuse a smell which seems to depend on the volatilization of an essential oil, which has sometimes produced fatal accidents. We do not conceive that this odour ought to be considered as an absolute poison, that is to say, as capable of poisoning all persons under all possible circumstances, but only as a relative poison, the effects of which depend on the greater or less nervous susceptibility, and on idiosyncrasy. How many persons do we see, who sleep with impunity in small and close rooms, where are several pots filled with odoriferous flowers; whilst others cannot remain there a few minutes without experiencing symptoms more or less grievous? We shall relate succinctly the principal accidents occasioned by the emanation of these odoriferous plants.

1st. Madame N . . . ., forty-six years of age, of a strong constitution, is not capable of remaining in any place where a decoction of linseed is preparing, without experiencing, a few minutes after, a considerable tumefaction of the face, followed by the loss of the intellectual faculties, and syncope. We have been eye-witness of this surprizing fact, and have seen the same thing repeated in the person of this lady by the adminis-

tration of glysters prepared with those seeds. The tumefaction of the face does not subside till after four and twenty hours.

2nd. *M. Vincent*, a celebrated painter of this capital, cannot remain in any room where there are roses, without being in a short time attacked with violent cephalalgia, succeeded by fainting. *Marrigues* thus expresses himself in the *Journal de Physique* (year 1780): "I have known a surgeon who could not smell at a rose without experiencing at the moment a singular suffocation, which subsided as soon as the rose was removed from him; and a young lady who lost her voice whenever a nosegay of odoriferous flowers were applied to her nose." *Ledelius* speaks of a merchant, in whom the smell of roses occasioned an ophthalmia.*

3rd. *M. Valtain* relates, that an officer experienced convulsions, and lost his senses, in consequence of having left in his room a certain quantity of pinks which he was very fond of. The basket filled with these flowers was removed immediately, and the windows opened. In the course of half an hour, the convulsions ceased, and the patient recovered his speech. From that time, the officer was never able, for twelve years after, to inhale the smell of pinks, without falling into a syncope.†

4th. *Valmont de Bomare* affirms, that the subtle and odoriferous parts of the betony in flower are so strong, that it is certain that the gardeners who gather this plant become intoxicated, and stagger as if they had been drinking wine.‡

5th. *Boyle* affirms, that if any one repose under the shade of a walnut or elder-tree, they would speedily fall asleep, and experience a severe head-ache.§

6th. Madlle. J. D. aged twenty-four years, was sitting at

* *Ephem. Nat. Cur. Dec.* ii. an. 2, Obs. xc.

† Prize of the Academy, *Hygiëne Chirurgicale*, p. 26.

‡ *Dictionnaire d'Histoire Naturelle.*

§ Boyle, *De Nat. Determ. Effluv.* in 4to. p. 38.

her window, and complained of a violent head-ache. All at once the extensores muscles contracted, she became stiff, and fell backwards, giving a loud scream. Every assistance was instantly given to her, and she soon recovered. *M. Barthelemy*, the author of this observation, having discovered that for some time past the patient had kept shut up in her room, roses, lilies, pinks, and honeysuckles, obliged her to renounce this practice, and she was no more incommoded: excepting once after she experienced slight constrictions in consequence of having worn in her belt a nosegay of honeysuckles; but the removal of the nosegay instantly caused them to disappear. (Inaugural Dissertation, maintained at Paris in 1812, No. 158.)

8th. *Sennertus* and *Boyle* have witnessed purgative effects produced by the smell exhaled from black hellebore and colocynth while pounding them.* The white hellebore has occasioned vomitings in those who gathered it.†

The Emperor Henry IV., a Prince of Savoy, Pope Clement VII., and some other personages, have been poisoned, according to the report of history, by perfumed gloves, or by the vapours exhaled from certain torches.‡

973. We could here relate a very great number of observations similar to the preceding: it shall however suffice us to say, that in general the following symptoms have been observed: numbness, palpitations, syncope, convulsions, cephalalgia, aphonia, several other nervous symptoms, and at last asphyxia.

SYMPTOMS PRODUCED BY THE NARCOTICO-ACRID POISONS.

974. The greatest number of poisonous substances of this

* *Encycloped*, l. c. p. 402.

† Amœnitates Academicæ, p. 200.

‡ Ambroise Pare, liv. xxi. chap. x.

class produce a series of remarkable symptoms, which are the same, whether they be introduced into the digestive passages, applied to the cellular texture, or injected into the veins. This character, rarely found in the poisons of the three first classes, exists, as we have already said, in those of the fourth. (*Vide* tom. ii. part i. p. 170.)

975. These symptoms may be reduced to the following: agitation, pain, acute cries, sometimes stupor, insensibility, convulsive movements of the muscles of the face, jaws, and extremities; the head frequently reflected upon the back, vertigoes, falling down, sometimes extreme stiffness of the limbs, accompanied by a general contraction of the muscles of the thorax, which prevents its motion; the eyes red, starting out of their sockets; insensibility to external impressions; pupils frequently dilated; organs of hearing scarcely, or not at all, susceptible of impression; mouth full of foam; tongue and gums livid; nausea, vomitings, frequent stools; pulse strong, frequent, regular or small, slow and irregular; lastly death, which is very speedy when the poison has been injected into the veins; it takes place later when it has been applied to the cellular texture; and generally later still, when it has been introduced into the stomach. We are far from wishing it to be thought that all these symptoms are produced by the same poisonous substance; we only affirm, that they may be observed in administering the different poisons of this class.

LESIONS OF TEXTURE PRODUCED BY THE NARCOTICO-ACRID POISONS.

1. Several of these poisons exert a local irritation capable of exciting a severe inflammation, which may terminate in gangrene. There are others, whose local action is much less; and lastly, some of them remain a long time in contact with the organic texture without producing the least rubefaction.

2nd. The lungs, blood, brain, membranes, and other organs,

present, in general, the alterations which we have detailed under the article *Narcotics* (tom. ii. part i. p. 171).

GENERAL ACTION OF THE NARCOTICO-ACRID POISONS ON THE ANIMAL ECONOMY.

976. 1st. Some of these poisons are rapidly absorbed, carried into the circulation, and act by exciting the spinal marrow: those animals that experience their effects are in possession of nearly all their intellectual faculties; but the contraction of the muscles is such, that the thorax becomes immovable, asphyxia takes place, and death is produced without the least trace of redness being discovered in the digestive canal. The *Upas-Tieuté*, the bean of Saint Ignatius, *Nux Vomica*, the *Angustura Pseudo-Ferruginæa*, are of this description. It is easy to perceive how improperly the denomination of *Narcotico-Acrid Poisons* is applied to these substances.

2nd. There are some of these poisons which are likewise absorbed, and which produce a strong excitement of the brain and of the whole nervous system, to which succeeds somnolency: in that case, there is loss of the intellectual faculties, and the animals die of asphyxia, produced by the immobility of the thorax. Inflammation in the texture of the digestive canal is rarely discovered; camphor, the *Cocculus Indicus*, *Picrotoxine*, and the Upas-Antiar, are of this kind. Certainly, the denomination of Narcotico-Acrid poisons is no more suitable to these, than to the preceding articles.

3rd. Some of the poisons of this class are absorbed, act on the brain or on some other parts of the nervous system, produce phenomena of excitement and lethargy, of which the animals die. They produce beside a local irritation more or less intense, which ought not to be considered as the principal cause of death: the *Belladonna*, tobacco, *Datura* Stramonium, the different species of hemlock, &c. are of this kind.

4th. Lastly, it appears, that a small number of these poisons instantly destroy life by acting on the nervous extremities: at least it is difficult to conceive that absorption can take place in so short a time: such are the oil of bitter almonds, the empyreumatic oil of tobacco, alkohol, &c.

TREATMENT OF POISONING BY THE NARCOTICO-ACRID POISONS.

977. The numerous experiments which we have hitherto made to discover an antidote to the different poisons of this class have been in vain; and we think we may affirm, that *in the present state of science, no substance is known which has the power of decomposing these poisons, and of converting them into a body incapable of exerting a baneful action when not vomited.* We are therefore reduced to the necessity of pointing out such means as are proper for diminishing, or putting a period to the symptoms to which they give rise.

978. The effects produced by the *Belladonna, Datura Stramonium, tobacco, Digitalis Purpurea, Anagallis Arvensis, Aristolochia Clematitis,* the different species of *Cicuta,* the *Nerium Oleander* and *Rue,* we are of opinion ought to be treated according to the following precepts:

1st. If the poison has been swallowed only a short time, and has not produced copious vomitings, an evacuant should be administered, composed of two or three grains of antimoniated tartrate of potash, and of twenty or four and twenty grains of ipecacuanha, dissolved in a small quantity of water; by these means the expulsion of them will be facilitated, and there will be no fear of hastening their absorption, provided that the quantity of fluid in which the emetic has been dissolved is not considerable. The vomiting may be assisted by tickling the throat with a feather.

2nd. If the poison has been some time ingested, and there be reason to suspect that it has already passed into the intes-

tinal canal, an emetic combined with a cathartic should be administered, composed of two or three grains of emetic tartar, and an ounce, or an ounce and half of sulphate of soda. Purgative glysters ought also to be administered.

3rd. If by these means the poisonous substance should be ejected, and the patient should exhibit symptoms of a cerebral congestion, we should not hesitate to have recourse to blood-letting, which it is preferable to effect from the jugular vein, and which should be repeated according to the temperament of the patient, and the advantages it may have procured. This method has in no case appeared to us to be hurtful, and we have frequently derived from it good effects. This should also be had recourse to in those cases where the administration of evacuants has been followed by no good effect, and there is present a congestion of the brain.

4th. Acidulated drinks should afterwards be employed, and especially vinegar and water, which should be exhibited in small doses, frequently repeated. This remedy has appeared to us to be particularly serviceable when much diluted, and administered immediately after the expulsion of the poisonous substance. In fact, if it were a little concentrated, it would add to the irritation produced by all of these poisons, and increase the inflammation of the texture of the digestive canal. It is probably for the same reason that it has appeared to us of little efficacy twenty, twenty-five, or thirty hours after the poisoning has taken place, when the inflammatory symptoms have already declared themselves. We are thoroughly convinced, that the use of acidulated drinks is in general prejudicial before the expulsion of the poison: 1st, because they are not favourable to the vomiting; 2nd, because they dissolve the active particles, and facilitate their absorption. *(Vide the detail of Experiments made with Opium,* p. 176, 177, *et sequent.)*

5th. When by means of these remedies we have succeeded in putting an end to the nervous symptoms, it will be neces-

sary without any delay to attend to the inflammation, which almost universally succeeds to the administration of poisonous substances of this kind. To this end, the acidulated drinks should be replaced by emollient infusions and decoctions, such as the infusion of mallow flowers, of violets, or a solution of gum arabic: the application of a few leeches to the abdomen may likewise be of service.

It rarely happens that any of the poisonous substances we have been speaking of, have been applied externally; should such a thing happen, it would be necessary to follow the same precepts, except the administration of evacuants; beside this, a ligature ought to be made above the part poisoned, and the wound should be cauterized, in order to prevent the absorption of the poison, and its being carried into the circulation.

979. The *Upas-Tieuté, Nux-Vomica, bean of St. Ignatius, Angustura Pseudo-Ferruginæa, Ticunas, Woorara, Upas-Antiar, Camphor,* and the *Cocculus Indicus,* as they produce effects different to those resulting from the preceding poisons, so they require, for their treatment, a peculiar method. *M. M. Magendie* and *Delile* have proved that sea salt, (muriate of soda, *Chlorure of Sodium),* which the Indians who have been wounded by the *Upas* make use of, is not the antidote to this poison, whether introduced into the stomach, or applied externally. The means which have proved most successful in their hands for doing away the effects of this substance, as well as of the *Nux-Vomica,* and the *bean of St. Ignatius,* consist in expelling the poison as speedily as possible, by means of emetics and tickling of the throat, and by opposing afterwards the asphyxia, which is the principal cause of death, by performing the operation of tracheotomy, and transmitting air artificially into the lungs. In a number of animals submitted to this mode of treatment, death has been greatly retarded, and has at last taken place only when the insufflation of the air was discontinued. In the cases where

these poisons have been applied to wounds made in the limbs, they prevented them becoming fatal, by drawing out instantly the weapon which had inflicted them, cauterizing the wound to the bottom, and passing a ligature above the wounded place. The efficacy of these precepts is confirmed by a fact generally known, that is, that a hæmorrhage of the limb operated on prevents the poisoning from taking place, because it prevents the blood from mixing with the deleterious substance. We have also found the utility of these means in the experiments which we have tried on the *Angustura*, *Camphor*, and the *Cocculus Indicus*. An emetic administered fifteen or twenty minutes after the ingestion of these poisons, has procured copious evacuations; the attacks have been less severe than usual, and it has been sufficient to prolong the insufflation for an hour, or an hour and half, *to prevent the animals from dying*. In some cases, we have deferred the administration of the emetic till the end of the first or second attack, and it has then been necessary to prolong the insufflation for three or four hours, in order to obtain the same results. Sometimes the animals would have died, but for the exhibition of a *draught* and *cathartic glysters*. It must be observed, that ether combined with water, and oil of turpentine, have appeared to us to produce a salutary influence towards restoring completely the health of animals that have been poisoned by any of these poisonous substances. We cannot dismiss this subject without impressing on the reader the importance which ought to be attached to the insufflation of air into the lungs: this operation requires considerable patience on the part of the practitioner; for it is only efficacious when employed for the space of several hours. We can warrant the having saved by this means fourteen animals out of twenty; and there is not the least doubt that they would have died in a state of asphyxia had it not been employed.

Mushrooms. We have tried the following experiments, in order to establish the respective value of vinegar, common

salt, ether, emetic tartar, and volatile alkali, in the poisoning by Mushrooms.

Vinegar. 1st. This vegetable acid possesses the property of dissolving the active part of the *Agaricus Muscarius*, and of the yellow hemlock Mushroom, to such a degree, that any one may with impunity eat either of these Mushrooms when cut into slices, and exhausted by this acid; but the liquor itself is extremely poisonous. This is conformable to the results obtained by *M. Paulet.* 2nd. These Mushrooms introduced into the stomach with vinegar, and in a quantity sufficient to prove fatal, put an end to life in less time than they would if the vinegar had not been administered, provided that the poison be not vomited, which undoubtedly depends on the property this poison possesses of dissolving the poisonous parts, the absorption of which becomes undoubtedly much easier. 3rd. Vinegar and water have appeared to us very serviceable in this kind of poisoning, when the poisonous Mushrooms have been expelled by evacuants.

Common Salt (Muriate of Soda) dissolved in water, possesses, like vinegar, the property of dissolving the active parts of these Mushrooms, and consequently presents the same advantages and disadvantages as that vegetable acid.

Sulphuric Ether, employed so much of late in the treatment of this kind of poisoning, is not free from danger when administered before the expulsion of these Mushrooms; for it likewise possesses the property of taking up their poisonous principle, as has already been noticed by *M. Paulet;* but it has appeared to us of excellent utility after the use of evacuants. In fact, we have restored the health of a number of dogs that had taken of the *Agaricus Muscarius* a sufficient dose to kill them, by making them swallow alternately, after having evacuated the poison, ether, and water impregnated with ether *(de l'eau éthérée)*, or the *Liquor Mineral. Anodyn. Hoffmann.*

The *Emetic Tartar*, and the *Emeto-Carthartics*, appear to us to be the remedies most to be depended on in this kind

of treatment; for death almost constantly takes place whenever these Mushrooms have not been evacuated.

M. Paulet has proved, that the volatile alkali *(Ammonia)* is rather pernicious than salutary; and that oil, theriaca, butter, and milk, are of no kind of use in this species of poisoning. *(Traité des Champignons,* par *M. Paulet,* tom. iii. ann. 1793, *Paris.)*

980. After having spoken particularly concerning each of the remedies proposed for the cure of the disease occasioned by poisonous Mushrooms, it is incumbent on us to establish the precepts by which the practitioner may be able to combat successfully the symptoms to which they give rise. 1st. He will facilitate the evacuation of the poison by means of emetics, or, what is better still, of *Emeto-Carthartics,* purgative draughts and glysters. In fact, the purgative medicines, in a great number of cases, deserve to be preferred to emetics, because the action of these Mushrooms is slow, and does not appear till ten or twelve hours after their ingestion; that is to say, after they have passed into the intestinal canal. Therefore the patient should be made to take three or four grains of the antimoniated tartrate of potash, combined with four and twenty grains of ipecacuanha, and six or eight drachms of sulphate of soda dissolved in water; there should likewise be administered, a draught composed of castor-oil and syrup of peach-flowers, and glysters of cassia pulp, senna, and sulphate of magnesia. When the Mushrooms have been well evacuated, it will be well to use a few spoonfuls of a mixture strongly impregnated with Ether; and, should the patient complain of pains and irritation in the abdomen, recourse should be had to mucilaginous drinks. It sometimes happens, in this kind of poisoning, that the antimoniated tartrate of potash, by itself, produces no evacuation. "The late Princess of Conti," says M. Paulet, "on her way from the court to Fontainbleau, in the Autumn, having perceived in the forest a number of poisonous Mushrooms, caused them to be gathered,

taking them for wholesome ones, and ordered her cook to serve them up at dinner, notwithstanding all that could be said against it. She had at her table, amongst other persons, the Bishop of Langres; and herself ate more of them than all the rest. Two hours after dinner, she felt an inclination to vomit, with fainting, and great anxiety; remained some time in a state of insensibility, stupor, and syncope, which caused great alarm for her life. Twenty-seven grains of emetic tartar, which were given in the course of the day, had not produced any effect, when the juice of horse-radish, and more especially a glyster prepared with a strong decoction of tobacco, procured a complete evacuation upwards and downwards,* which caused her to throw up the Mushrooms in the same state as she had eaten them. She passed blood by stool, and there was for a time an apprehension of an inflammatory state of the bowels, in consequence of the excessive irritation produced by the medicines. She was a very long time in recovering, and milk greatly contributed to her final restoration." 2nd. It would be imprudent to administer irritating purgatives, if the inflammation of the abdomen has already made a rapid progress: so likewise, if there should be fever joined with a painful tension of the belly, cardialgia, and dryness of the tongue, accompanied by extreme thirst, and a burning heat of the skin, as well as in the mouth and throat, it will be necessary to have recourse to bleeding, and other antiphlogistic means. *Forestus* speaks of a young person who had been poisoned by Mushrooms, whom he cured by bleeding on the sixth day of the disease. 3rd. When all these symptoms shall have disappeared, tonics should be had recourse to, such as white wine, bark, &c.

Alkohol and other Spirituous Liquors. Drunkenness, when not carried to a very high pitch, goes off of itself in the course of seven or eight hours. In any case where it might

* We have proved that the decoction of tobacco, when injected into the rectum of dogs, constantly produced vomitings.

be protracted to a longer period, and the patient be plunged into a state of deep coma, it would be best to have recourse to emetics, and afterwards to acidulated drinks. Bleeding may be had recourse to where the patient is young, robust, and of a decidedly sanguineous temperament. Irritating glysters should likewise be employed, and washing with vinegar over the whole surface of the body.

Asphyxia proceeding from the Vapour of Charcoal, and Carbonic Acid Gas. 1st. It will be necessary to begin by undressing the person thus asphyxied, and exposing him to the open air, placing him on the back, with the breast and head somewhat more elevated than the rest of the body, in order to facilitate the respiration. 2nd. The breast and face should be sprinkled with cold vinegar and water; at the expiration of three or four minutes, these parts should be wiped with hot towels, and the patient should be placed in a bed quite hot, where he should remain two or three minutes, after which, the aspersions should be repeated. This practice is essentially necessary, for the body will in the end become insensible to the action of cold water. 3rd. By means of a tube, atmospheric air should be blown into the lungs through the mouth, or, what is better still, through one of the nostrils, the other being compressed by the fingers, in order to prevent its escaping; and, for the purpose of facilitating the play of the organs of respiration, napkins dipped in very cold liquids should be applied repeatedly to the abdomen, and kept there only two or three minutes, when they should be replaced by cloths which are very hot. Should these means prove ineffectual, an opening may be made in the trachea, and a small tube introduced, which may be blown into by the mouth, or with a small pair of bellows. 4th. The patient should be made to swallow some cold water slightly acidulated with vinegar. 5th. Frictions should be used over every part of the body with a heated napkin, or with a piece of linen dipped into camphorated spirit of wine, *eau de Cologne*, spirit of

lavender, or any other stimulating liquor: the soles of the feet, and the whole course of the vertebral column, should be irritated with a strong hair brush. 6th. Lighted matches with plenty of brimstone should be held under the nose, in order to irritate the pituitary membrane, or the patient should be made to snuff up some volatile alkali, or *Hungary water*. 7th. Glysters should be administered of vinegar and water; and, after that, others of common salt, senna, and sulphate of magnesia. 8th. When, after having employed general frictions, the heat of the body is restored, recourse may be had to bleeding at the jugular vein, cupping, and the *moxa*. 9th. Emetics and fumigations of tobacco should be avoided. 10th. Lastly, when the person asphyxied shall be completely restored to life, he should be placed in a warm bed, where the air has free access, and some hot wine with a few spoonfuls of some stimulating mixture should be administered to him.

Ergotted Rye. Read is the author who appears to us to have given the best precepts for the cure of the disease termed *Ergotisme:* "Should the little degree of activity of the *Ergot* when taken in small dose," says he, "produce only fever accompanied by convulsive symptoms, spasmodic motions, and confusion of the head; these phenomena require a treatment peculiar to themselves, with this difference only, that the use of acid drinks ought to be continued through all their different stages. In those cases where fixed pains, numbness, and the cold which succeed to them announce the approach of the dry gangrene, the following treatment is most proper to prevent it, and to arrest its progress, in fine to render its consequences less terrible.

"The state of the pulse alone should determine the necessity of bleeding, a remedy that should in all cases be employed with great moderation. Emetics administered in the beginning of the disease, produce salutary effects; but they are indicated only when we can be assured that the nauseas do not depend on the irritation of the stomach alone, and the

bitterness of the mouth shews a congestion of foul humours in the *primæ viæ*. Ipecacuanha in infusion, to the dose of a drachm, sharpened with a grain or two of stibiated tartar, fulfils this indication without any remarkable trouble. The day after the emetic, the patient should be purged by a gentle cathartic, if there be no fever, or but in a slight degree: in that case, purging glysters should take place of the draught. An infusion of elder flowers should be given for the common drink of the patient, with infusion of marshmallow and barley water, to which may be added four spoonfuls of vinegar, as much honey, and a grain of emetic tartar to each pint of the fluid. We may substitute for this drink a weak lemonade with little sugar, and sharpened likewise with the stibiated tartar.

" As soon as the patients complain of numbness and coldness of the limbs, there should be applied to the parts affected, cloths soaked in a decoction of aromatic plants, but, previous to their application, the parts should be rubbed with the hand or some flannel: large blisters should be applied to the parts in the immediate vicinity of the benumbed limbs. The patients should immediately begin with the use of the following decoction. Take four ounces of good cinchona in coarse powder, half an ounce of sal ammoniac; boil the whole in a pot of spring water; towards the end of the decoction add to it two *pugilli* of chamomile flowers. The patient should take every three hours four ounces of this drink. Should the numbness and coldness continue after the application of the aromatics, the action of the blisters, and the use of the decoction just pointed out, this last must be employed to foment the parts threatened with gangrene.

When the limbs affected actually mortify, Read recommends the fomenting them with the following preparation. Take four ounces of calcined alum, three ounces of Roman vitriol, one ounce of common salt; boil the whole in two pints of water, till reduced to half. Should sphacelus notwithstanding all these means take place, and the amputation of the limb

become necessary, we must wait till nature herself points out the time and place for this operation, by a line of separation between the living and dead parts." (Op. citat.)

Odoriferous Flowers. We must begin by removing the flowers that surround the patient; after which, the disease they have occasioned must be attended to. Asphyxia will be best combatted by the means we have before pointed out; head-aches, syncopes, and nervous affections will require the use of tonics and antispasmodics.

CHAPTER VI.

CLASS VI.—SEPTIC AND PUTREFYING POISONS.

981. The name of Septic Poisons has been given to such as produce a general debility, dissolution of the humours, syncopes, and which do not in general alter the intellectual faculties.

OF THE HYDRO-SULPHURIC ACID GAS (SULPHURATED HYDROGEN).

982. *Characters.* This gas is colourless, transparent, possessed of an excessively fetid smell, similar to that of rotten eggs; *it reddens the infusion of tournesol;* when set on fire in the open air, it burns with a bluish flame, and deposits on the sides of the bell which contains it, a certain quantity of sulphur of a yellow colour; when mixed with *chlorine* (oxygenated muriatic gas) it is instantly decomposed, parts with its hydrogen, which becomes converted into hydro-chloric acid, and the sulphur is set at liberty; it is soluble in water, and gives a clear yellow precipitate with the arsenious acid, a black one with the salts of copper, of lead, and of bismuth. These different precipitates are *sulphurets* of arsenic, copper, lead, and bismuth: whence it follows, that the hydrogen of the hydro-sulphuric acid seizes upon the oxygen of these metallic oxydes to form water; whilst the sulphur and the metal resulting from the operation combine and produce an insoluble sul-

phuret. These properties are more than sufficient to distinguish the Hydro-Sulphuric Acid Gas from all other bodies.

ACTION OF HYDRO-SULPHURIC ACID GAS ON THE ANIMAL ECONOMY.

983. It has long been known that animals die in a few seconds after being immersed in the Hydro-Sulphuric Acid Gas, so that it has in consequence been regarded as one of the most deleterious of bodies. *M. Chaussier* has made on this subject a series of curious experiments which he has given in an excellent Memoir published in 1802;* *M. Nysten* has since undertaken some new experiments on the same subject, which are extremely interesting, and which may be regarded as the complement of *M. Chaussier*'s labour.† We have carefully repeated the experiments of these two physiologists, and have found them extremely correct: therefore from their writings we shall give the following extract.

Experiment 1st. Any animal, of what kind soever, dies in the space of a few seconds if immersed in an atmosphere of Hydro-Sulphuric Acid Gas; it is somewhat longer in dying if this gas be mixed with a very great quantity of atmospheric air. According to *M. M. Thénard* and *Dupuytren*, it is sufficient that the air contains $\frac{1}{1500}$, in order to kill a bird in a very little time: that which contains $\frac{1}{800}$ produces death to a dog of middle size, and a horse in the end dies in an atmosphere containing $\frac{1}{250}$ part of it. After death, it is found that the nasal cavities and bronchia are lined with a viscid mucosity of a brownish colour; the blood is thick and black; the muscles possess hardly any of their contractility, and are likewise blackish; the lungs, liver, spleen, kidneys, brain, and in general all the organs which receive a great number of blood-vessels, have a brownish or blackish tinge; there is a di-

* *Journal de Sedillot, Octobre*, 1802, p. 19.

† Op. citat. p. 126.

minution of the consistence of all the soft parts, which are easily torn, exhale a fetid smell, and pass rapidly into a state of putrefaction.

Experiment 2nd. Ten *centimetre* cubes of Hydro-Sulphuric Acid Gas, were injected into the jugular vein of a dog whose pulse was beating a hundred and two strokes in a minute. A few seconds after, the animal appeared very much agitated, and uttered acute cries; but soon after became quiet, the pulse was extremely feeble, and beat only sixty-eight strokes in the minute. Eight minutes after the injection, the animal had recovered his strength, and the pulse was beating seventy-eight. A fresh injection was then made of twenty *centimetre* cubes of gas: instantly after, cries, convulsions, bending backward of the body, pulse imperceptible, death. The body was immediately opened; the sanguineous system contained no gas; the heart was distended with black blood; the lungs exhibited a beautiful rose colour.

Experiment 3rd. At fifty-two minutes after nine, ten *centimetre* cubes of gas were injected into the jugular vein of a dog of middle size, whose pulse was beating a hundred and six times in the minute. Immediately after, the animal was agitated, made a few deep inspirations; his pulse beat only ninety. At fifty-five minutes after five, the breathing was natural, and the animal calm. The same dose of the gas was again injected; the breathing became loud, and extremely frequent; some convulsive movements appeared; the pulse beat seventy-two strokes in the minute: these symptoms in a short time subsided. At two minutes after ten, a fresh injection of the same quantity of gas; instantly the animal was agitated, and cried out, the limbs were stretched out, the breathing was suspended, and he appeared to be dead. At the expiration of a few minutes, the breathing was restored; it was at first deep and rare. At seven minutes after ten, it was performed in the natural manner. The animal was let loose; he remained lying on the side, in a state of great pros-

tration; his limbs were very much inflamed, and his pulse beat seventy times per minute. Three minutes after, he appeared less overcome; he supported himself upon the anterior extremities; his head nodded from time to time; a few moments after, he was able to walk, but his progress was vacillating. At fifty-five minutes after ten, he was upon his feet, and appeared stupified, without shewing any signs of suffering; the pulse was feeble, and beat ninety times in the minute. The next day, he was recovered. One of the crural arteries was opened, and there issued blood of a vermillion colour. *(Nysten.)*

Experiment 4th. Forty *centimetre* cubes of Hydro-Sulphuric Acid Gas were injected into the right pleura of a dog of middle size. At the same moment, the trunk was bent backward, the limbs became stiff, an emission of urine and excrement took place, and the animal died. He was opened a short time after. The pleura that had been operated on was of a greenish colour; the heart, which was not opened till after four and twenty hours, contained black coagulated blood, without any concretion, apparently gelatinous. There was no gas in the sanguineous system.

Experiment 5th. The same experiment repeated on another dog, with twenty *centimetre* cubes of gas, presented at first similar phenomena. At the end of one minute, there was no longer any respiratory movement; the loco-motive muscles were agitated by slight convulsions; the pulse was frequent and strong, but soon after became imperceptible. To this state succeeded a general relaxation. Two or three minutes after, the animal made a deep inspiration, the pulse became again perceptible, and the respiration was restored, but animal life appeared extinct for a quarter of an hour; he was no longer able to make two steps without staggering and falling. Half an hour after the injection, the cerebral functions no longer exhibited any sign of serious lesion; the animal was affected with a general trembling and foaming at the mouth.

An hour and five minutes after the injection, he still staggered in walking. The next day, he was entirely recovered.

Experiment 6th. When Hydro-Sulphuric Acid Gas, or Hydro-Sulphuric water are injected into the subcutaneous cellular texture of rabbits and frogs, death takes place in the course of a few seconds. Dogs also die in a very short time, amidst convulsions, and uttering acute cries. The internal organs present no remarkable lesion, but the vessels distributed over the portion of cellular texture where the injection is made, are distended by a black viscid blood, or else by blood of a greenish tinge: the more superficial muscles partake of this tinge.

Experiment 7th. Rabbits, ducks, and young guinea-pigs, perish in a few minutes, when the whole of their body, except the head, is plunged into bladders containing Hydro-Sulphuric Acid Gas. One rabbit died, that had only the thigh immersed in the bladder. Death takes place more speedily when these animals are plucked. On opening their bodies, the subcutaneous vessels were found full of a brownish, viscid blood, the cellular texture soft, the skin easily torn; but the other parts retained their natural colour and consistence. A dog was submitted to an experiment of this kind, by exposing to the action of the gas only one of his hind legs that had been shaved. The animal had experienced nothing at the expiration of an hour; which doubtless depends on the circumstance of the absorption being null, or extremely weak, on the surface of the *cutis* of these animals.

Experiment 8th. The Hydro-Sulphuric Acid Gas, and the Hydro-Sulphuric water, when injected into the great intestines of rabbits and of horses, causes the death of these animals in less than a minute, and the abdominal vessels are found to be filled with black blood, very thick; the great intestine of a brownish colour; the liver, the spleen, and the kidneys darker than in their natural state: there is no alteration in the viscera of the thorax, and head. Similar effects are ob-

served, when these poisons are injected into the stomach. After death, the blood is fluid, and of a deep brown colour in the arteries; the mucous membrane of the stomach is soft, tears with the greatest ease, and presents a blackish colour. The other viscera appear sound.

Observations.

M. M. Dupuytren and *Thénard* have proved that the asphyxia of privies, on which subject *M. Hallé* composed a very fine work in 1784, depends sometimes on Hydro-Sulphuric Acid Gas, or on the Hydro-Sulphate of Ammonia. The following are the observations collected respecting the human species, by *M. Dupuytren:* sometimes the patients are strongly asphyxied, and death takes place in a very short time: but under other circumstances, the symptoms of asphyxia are less intense; in that case the patients may be carried into the open air; and it is observed, that after having lain some time in a state of apparent death, they make deep inspirations; the breathing becomes restored by degrees, and continues to be laborious; the motion of the heart becomes perceptible; nevertheless, the pulse is weak and small; the digestive and loco-motive apparatus have lost their contractile force; the functions of the brain are suspended; and if the patient finally recovers his health, he is a long time in re-establishing his strength.

On taking a view of the symptoms hitherto observed in the human species and animals submitted to the influence of the Hydro-Sulphuric Acid Gas, they may be reduced to the following: acute cries, convulsions, violent contractions of the abdominal muscles, agony; pulse unequal, intermitting, convulsive; respiration sometimes accelerated, sometimes suspended, often accompanied with a throbbing of the flanks; loss of lustre of the eyes, and sensation of cold in the ears. *(Chaussier.)*

984. The preceding facts induce us to conclude:

1st. That the Hydro-Sulphuric Acid Gas, and the Hydro-Sulphuric water, are energetic poisons for all sorts of animals; that the gas is extremely active when respired; that it is less so when introduced into the pleura or jugular vein; that it is still less so when injected into the cellular texture, into the stomach, or intestines; lastly, that its action is less rapid when applied to the surface of the skin, and, as *M. Nysten* has observed in this instance, its action is so much the more energetic according as the animals are of less bulk; so that a man may without any inconvenience submit himself to the use of sulphureous baths, in which this gas is disengaged, provided that he does not stay in them too long, and that the gas does not enter into the lungs;

2nd. That it is completely absorbed without undergoing the least decomposition; that, when carried into the circulation, it induces a general debility, a prolonged alteration in the texture of the organs, and principally in the nervous system, and probably in the composition of the blood;

3rd. That nevertheless, it may be injected in a small dose into the venous system of animals, without producing any fatal symptoms;

4th. That it does not kill by effecting the distension of the pulmonary ventricle of the heart, since it is extremely soluble in the blood;

5th. That it appears to act on the human species as on animals.

TREATMENT OF THE ASPHYXIA PRODUCED BY HYDRO-SULPHURIC ACID GAS.

985. We should begin by putting in practice all the means which we have advised when speaking of Asphyxia from charcoal (*vide* p. 366); after which, a few spoonfuls of olive oil may be administered, with the intention of exciting vomiting; at least this practice has been attended with success in persons

who have been asphyxied in privies. Should it be intended to destroy the infection in a place where this gas exists in great abundance, it will be necessary to have recourse to chlorine, which possesses the property of decomposing it (*vide* p. 370 of this Part). *M. Dupuytren* has put an end to the Asphyxia in a number of animals, who had inspired the Hydro-Sulphuric Acid Gas, by this method.

ACTION OF CERTAIN PUTREFIED SUBSTANCES ON THE ANIMAL ECONOMY.

Experiment 1st. At eight in the morning, half an ounce of the blood of a putrefied dog was applied to the cellular texture of the inside of the thigh of a robust dog of middle size. The animal experienced no remarkable symptom in the course of the day. The next day, at five in the morning, he vomited after having made a number of fruitless efforts; he was dejected, and lying on the side; he made from time to time deep inspirations; he was raised up, and walked without staggering, but slowly, and very soon lay down again; the dejection went on increasing, and he died at half past ten. Three hours after, the body was opened; the limb operated upon, and all the corresponding side up to the third sternal rib, were very much inflamed, and of a livid red colour; the digestive canal appeared sound; the lungs contained a tolerably large quantity of black fluid blood; there were found in the ventricles of the heart some blackish coagula.

Experiment 2nd. The same experiment was repeated upon another dog not so strong as the preceding, who died eighteen hours after the application of the blood, and exhibited the same results on dissection.

Experiment 3rd. About six drachms of the bile of an ox in a state of putrefaction, were injected into the cellular texture of the thigh of two great dogs. At the end of fifteen hours, these animals made some efforts to vomit, and threw

up a quantity of alimentary matter; they uttered plaintive cries, and fell into a state of dejection. Six hours after, they were found dead. It was impossible to find the least alteration in the internal organs. The whole of the side corresponding to the limb operated on, was in a state of suppuration, and of a clear red colour, whilst the opposite side was quite sound.

Experiment 4th. Two dogs were operated on in the same manner, and a portion of stomach completely putrid, but which had only undergone a softening of its substance, was applied to their cellular texture. They did not experience any accident; the appetite did not fail them, and the wound was healed up in the course of a few days.

Experiment 5th. As a substitute for these substances, a portion of the *encephalos*, so putrefied that it was in the form of a thick soup, was employed. The animal, which was a robust one, died in a state of dejection eighteen hours after. The inflammation of the wound was somewhat extensive, but the suppuration was tolerably abundant.

Professor Fodéré justly classes corrupted aliments amongst the poisons. " The vomitings," says he, " fetid discharges through the nose, and the syncope, which take place immediately after having taken these horrible meats into the stomach, give us notice of the dangers which we incur, and of the remedies proper to be had recourse to." He relates beside, that at the siege of Mantua, a number of persons who were obliged to feed on horse-flesh half putrid, had the dry gangrene and the scurvy.

986. The facts which we have just related, do not appear to us sufficiently numerous to decide whether the different symptoms and death produced by putrefied substances depend on the local irritation they produce, or on their being carried into the circulation. It is our intention to compose a work on this subject, in which we propose to examine: 1st, *What are the chemical alterations which the animal fluids undergo after*

death? 2nd, *Their action on the animal economy, or the kind of local and general disease to which they give rise when in a state of putrefaction;* 3rd, *The decompositions that the animal fluids undergo in certain diseases during the life of the patient,* (a decomposition which appears to us incontrovertible, notwithstanding the opinions of the *solidists*) *and the affections they produce by their contact with the living texture.*

OF VENOMOUS ANIMALS.

987. The name of *Venomous Animals* is given, 1st, to those which contain a reservoir for poison, and whose bite, although trifling, produces severe symptoms, followed sometimes by death; 2nd, to those in which no such reservoir has been discovered, and which occasion the most terrible symptoms after being eaten; 3rd, to those whose fluids have been so vitiated by antecedent diseases, that their contact produces likewise fatal effects. Those animals too have been qualified with the name of *Venomous,* in a state of health, who contain no reservoir of poison, but whose sting produces symptoms which any acute body whatever would occasion. We shall treat successively of these different sections.

OF VENOMOUS ANIMALS, WHOSE BITE OR STING IS ACCOMPANIED BY SYMPTOMS MORE OR LESS SEVERE.*

OF THE VIPER.

(Vipera Berus, Coluber Berus, Anguis Cinerea, macula dorsi fusca, longitudinali, dentata Linnæus.)

988. The genus *Viper*, as adopted by *Latreille* and *Daudin*, comprises all those serpents that have the head triangular, flattened, broad posteriorly, terminated like a snout, with projecting edges, and which contain *venomous fangs*.

Specific Characters. Its length is commonly two feet, sometimes, but rarely, from twenty-eight to thirty inches; it is about an inch in thickness; its colour varies from an ash or greenish gray, to the darkest gray; it is always deeper on the back than on the sides, where it is constantly marked with brown spots symmetrically laid out. It exhibits on the back, a black band arranged in rhomboidal figures, which extends from the neck to the extremity of the tail: this band is sometimes interrupted, but most commonly is complete. The belly and the part underneath the tail, are furnished with several transversal plates, of the colour of polished steel; the number of these plates is generally a hundred and forty-six under the belly, where they are simple; and thirty-nine under the tail, where they are smaller and double, or disposed in two rows. The head of the viper is broader posteriorly, flatter, and not so

* These animals might moreover be subdivided into two sections: 1st, those that emit a venomous fluid contained in some reservoir, such as the Vipers, the Crotali, 2nd, those that are destitute of this fluid, and act only mechanically. Comparative anatomy has not yet sufficiently enlightened us on this subject to make a proper use of this division.

long as that of snakes; the end of the head is as it were truncated, and forms a prominent ridge, turned up like the snout of a hog, covered with scales broader than those of the back, spotted with black and white. On the top of the head are seen two black lines, which run from the fore to the hind part, diverging in such a manner as to resemble the letter V: these lines are separated by a brown spot, in the shape of the top of a spear. The tail, which is shorter than that of snakes, is somewhat obtuse, and thicker in the male than in the female. The eyes are bright, sparkling; its look is fierce, especially when irritated. The tongue is gray and bifurcated, and when the animal is animated, it agitates it with impetuosity, in such a manner, that it appears like a flaming dart. These characters are more than sufficient to distinguish the Viper from the common snake, and the *Orvet (Cecilia)*.

The principal varieties of the common Viper are, 1st, those which have the band on the back formed with round spots, and that on the tail with transverse ones; 2nd. The common reddish Viper, having the neck extremely small, and the head party-coloured; 3rd. The common Viper, with a white spot, surrounded by a brownish arched line upon the occiput; 4th. That which exhibits on the top of the head a spot divided into several parts; 5th. The adder *(Vipère-Aspic)*, which has the angular and black band on the back frequently interrupted by the brown or red colour of the ground, with the spots of the sides more distinct.

The common Viper is only found in Europe. It is met with in Italy, Spain, Germany, in the British Isles, the plains of Siberia, in the vicinity of Paris and of Fontainbleau, &c.

989. The venom of the Viper is contained in a bag situated on both sides of the head, beneath the muscle of the superior jaw; this last exhibits two moveable teeth, very sharp towards the point, hollowed throughout their length. When the animal intends to bite, he presses the bag by means of the muscle; the venom comes out, arrives at the base of the tooth, passes

through the sheath which envelopes it, and enters into its cavity by a hole which is found at this base; then it flows along the hollow of the tooth, and issues by the hole which is near its point, in order to penetrate into the wound.

PHYSICAL AND CHEMICAL PROPERTIES OF THE VENOM OF THE VIPER.

990. It is neither acid nor alkaline, for it does not redden the tincture of tournesol, nor turn the syrup of violets green. It is neither acrid nor burning; it produces on the tongue only a sensation similar to that of the fresh fat of animals; it possesses a slight smell, resembling that of the Viper's fat, but much less nauseating; it gives no effervescence with acids; when put into water, it sinks to the bottom; if mixed with this fluid it renders it turbid, and slightly whitens it. It does not burn when exposed to the flame of a candle, or placed on burning coals. When fresh it is somewhat viscid; and when dried it adheres like pitch. It appears to be of a gummy nature.

ACTION OF THE VENOM OF THE VIPER ON THE ANIMAL ECONOMY.

991. The celebrated *Fontana,* who made near six thousand experiments on the bite of the Viper, concluded that the following facts might be established.

1st. The poison of the Viper is not a poison for all animals; *leeches* do not die even when it is introduced into their wounds; the same thing happens to slugs, snails, the adder, the snake, the *orvet; eels,* the *Viper* itself,* small *lizards,*

* The author is evidently mistaken here in asserting, on the authority of the Abbé Fontana, that the venom of the Viper is fatal to the Viper itself. The title of the Vth Chapter, Part I. vol. i. of his work, runs thus: *Le venin de la Vipère n'est pas un poison pour son espèce;* and he has proved incontestably

and all warm-blooded animals die from it; death takes place with great difficulty in the *tortoise*, in whatever part it may be bitten.

2nd. The venom of the Viper is not uniformly fatal, except in very small animals; it is so much the more dangerous in the larger ones, in proportion as the Viper happens to have a greater quantity of venom in reserve; as it may bite the oftener, and in the greater number of places; and probably as the heat of the weather may be more intense. The hundredth part of a grain introduced into a muscle, suffices to kill a sparrow. Six times that quantity is required to destroy a pigeon; and, keeping in view the size and weight, *Fontana* has calculated, that it would take about three grains to kill a man, and twelve to destroy an ox. Now, as a Viper carries in his vesicles only about two grains of venom, which it does not exhaust even after several bites, it follows, that a man might receive the bite of five or six Vipers without dying from it.*

3rd. The venom of two Vipers injected into the jugular vein of several large rabbits, produced death in less than two minutes, amidst screams and strong convulsions. The blood in the ventricles of the heart was coagulated. *Fontana* adds, moreover, that the intestines, the stomach, mesentery, and abdominal muscles were inflamed.

4th. The venom of the Viper, applied by the bite of the animal, produces the following symptoms: sensation of acute

by a number of experiments, that the venom is perfectly harmless to animals of its own species.—TRANSLATOR.

* *M. Bosc* relates a curious fact, of which he was a witness during his residence in America: "two horses were bitten in one enclosure, on the same day, by a black Viper: one on the hind leg, the other on the tongue: this last died in less than an hour, and the other was quit for a swelling of a few days' continuance, and a debility of a few weeks. The loss of the former was caused by a violent inflammation, which closed up the glottis, and produced an asphyxia. Should not the bite of the Viper be considered as much more dangerous, and even fatal, when the parts bitten are not far distant from the heart?" (*Dictionn. d'Hist. Natur.*, Article *Vipère.*)

pain in the part wounded, which extends over the whole limb, and even to the internal organs, with tumefaction, and redness which passes afterwards to livid, and gains by little at a time on the neighbouring parts; considerable syncopes, pulse frequent, small, concentrated, irregular; difficulty of breathing, copious and cold sweats; disturbance of vision, and of the intellectual faculties; heaving of the stomach; bilious and convulsive vomitings, followed almost universally by a general yellowness; sometimes pains in the umbilical region. The blood which flows at first from the wound, is frequently blackish; some time after, there issues out a sanies, and gangrene takes place when the disease is about to terminate in death. Climate, seasons, temperament, &c., exert a singular influence on the nature and progress, more or less rapid, of the symptoms occasioned by the bite of these animals. The symptoms are much more to be dreaded in South America, and during summer, than in Europe, as *M. Bosc* has observed. In persons that are weak and timid, that have a full stomach, the symptoms make their appearance with much greater rapidity, and are more serious than in robust persons, and such as are not easily frightened.

5th. The venom of the Viper applied to the skin of Indian capons and of rabbits slightly abraded, is not fatal.

6th. It produces only a slight disease of the skin in guinea-pigs, and one somewhat more intense in rabbits.

7th. This disease is circumscribed in that part of the skin which has been touched by the venom.

8th. When the Viper bites the skin of these animals quite through, they die in a short time.

9th. The venom appears not to be mortal, if it penetrates only into the cellular texture.

10th. It is altogether innocent if simply applied to the muscular fibres.

11th. Animals bitten or wounded by a venomous tooth of a Viper in the breast, belly, intestines, and liver, die in a space of time of greater or less duration.

12th. The contrary is observed when the venom has been applied to the ears, the pericranium, the periosteum, dura mater, the brain, marrow of the bones, the transparent cornea, the tongue, lips, palate, and stomach: it happens even frequently enough, that a number of animals submitted to these experiments exhibit no sensible phenomenon.

13th. The Viper's venom, when applied upon the nerves, does not produce any effect, nor does it accelerate the death of the animal; it is as innocent for the nerves as pure water, or simple gum arabic.

14th. It produces no sensible change on parts detached from an animal, and which consequently are still palpitating.

15th. The action of this venom is not instantaneous; a certain time is necessary before the effects become sensible, either in the part bitten, or in the other organs: this time varies in different animals according to their constitution, size, &c. According to *Fontana*, it may be reckoned, in a certain number of animals, from fifteen to twenty seconds.

16th. The symptoms which it produces depend on its absorption, its being carried into the circulation, and on the action it exerts on the blood, which it partly coagulates, and on the nervous irritability, which it destroys by conveying into the fluids a principle of putrefaction.

17th. It preserves its energy in a Viper's head that has been cut off a long time, or when it has simply been left in the cavity of the tooth separated from the alveolar process. Animals have been known to die from having been pricked by the tooth alone. When dried for several months in an open place, it loses its property, and leaves no impression on the tongue.

18th. Animals die more speedily when they have been bitten an equal number of times in two places, than when bitten in one only.

19th. The part which has received alone as many bites as

the others together, is subject to an external disease much more considerable.

We may add to these observations the results of a work undertaken by *M. Paulet*, on the Viper, called *of Fontainbleau*, which is also a *Vipera Berus*, notwithstanding the opinion of this physician, who regards it as a particular species. This work proves, contrary to the assertion of *Fontana*, that the bite of the common Viper is capable of becoming fatal to the human species. (*Observations sur la Vipère de Fontainbleau*, published in 1805.)

1st. The venom it is furnished with, when inoculated by a wound, or by the prick which it makes, is in general fatal to men and animals, principally for such as are weak and easily frightened. A child seven years and a half old, was bit below the inner ancle of the right foot, and died seventeen hours after. Another child two years old, expired three days after having been bitten in the cheek. A horse, which had been weakened by previous disease, died likewise from a bite in the cheek, at the end of eighteen hours.

2nd. The most common symptoms from the action of this venom are; a tumour, at first firm and pale, afterwards reddish, assuming a gangrenous character, and making a progress more or less rapid on the side next the heart; this tumour is shortly after followed by syncope, vomitings, convulsions, and death: the intensity of these symptoms is in an inverse ratio to the size of the animal bitten, or to the distance of the wound from the heart, and the slowness of the pulsations of the arteries.

The following is an observation of the bite of this Viper.

Laurino, a grenadier of the Imperial Guard, was severely bitten on the second phalanx of the fore-finger of the left hand. He experienced at the moment a pain excessively sharp; the part bitten swelled up almost immediately after. A strong ligature was made on the top of the first phalanx, near its articulation with the metacarpus: the inferior part

swelled up considerably. *M. Paulet,* who saw this grenadier an hour afterwards, found the skin of the bitten finger in a state of extreme tension, and more pale than the surrounding skin. He made eight or ten scarifications along the whole length of the tumefied finger. The patient, who had experienced neither syncope, nor vomiting, nor any pain, save that produced by the bite, experienced a kind of weakness similar to what might have been caused by a profuse bleeding. The part when untied, was completely emptied. He was made to take a drachm of theriaca in a glass of wine, and the part was dressed with compresses of camphorated spirit of wine. An infusion of the flowers of the *Tilia* was administered to him. The next day, the part bitten was in a good condition; but some person caused the volatile alkali to be applied to it, which produced a severe pain and tumefaction, which communicated itself from the hand up to the top of the arm: the compresses soaked in camphorated spirit were renewed; a perspiration soon came on, and the patient was perfectly restored at the end of seventeen days.

OF THE *VIPERA NAJA (COLUBER NAJA* OF LINNÆUS, *CHINTA NAGOO* OF THE INDIANS, *COBRA DE CAPELLO).**

Experiment 1st. In the month of June, 1787, a dog was bit in the inside of the thigh by the *Comboo Nagoo* (a variety of this species of serpent). The animal immediately uttered very plaintive cries; he lay down two or three minutes after, and continued to complain and to bark. At the end of twenty minutes, he rose again; but could with difficulty sup-

* All which we are about to say of this serpent and the four following, is extracted from the admirable work of Russel, entitled: *An Account of Indian Serpents collected on the Coast of Coromandel,* by Patrick Russel. London, 1796. 2 vols. in fol.

port himself, and was not able to walk; his organization appeared deeply affected: he soon lay down again, was greatly agitated; a few moments after, convulsive movements; and he died twenty-seven minutes and a half after being bit.

Experiment 2nd. In the month of July, in the same year, a great strong dog was bit in the inside of the thigh by another variety of the *Vipera Naja*. Two minutes after, the thigh was drawn up, a symptom which in general proves that the animal is under the influence of the poison. He continued however to walk for an hour, supporting himself on the other three limbs, without shewing any other symptom. He then extended himself on the ground, appeared extremely unquiet, passed a stool, but uttered no cries. A short time after, he was agitated with violent convulsive movements in the head and throat; his posterior extremities were paralyzed, and he made fruitless efforts to rise. This state continued till the moment of death, which took place two hours after the bite.

Experiment 3rd. Immediately after, a black bitch was caused to be bitten by the same reptile, and nearly in the same place. Seeing that she exhibited no remarkable symptom at the end of an hour and half, she was made to be bitten by a *Cobra* which had not bit any thing for several days. The bite was made with fury; notwithstanding no symptom had made its appearance two hours after. During the hour which succeeded, the animal became a prey to all the symptoms previously related, and died five hours after the second bite.

Experiment 4th. On the 20th of July, in the same year, a large strong dog was bit at the same place by the *Scinta Nagoo*, a variety of the *Vipera Naja*. In a short time, he was under the influence of the poison, and at the end of half an hour, was extremely ill. The symptoms acquired greater intensity during the second hour: the breathing was laborious, especially when he was lying on the side. All at once he rose up, and howled horribly: he had a general trembling. A

short time after, he fell into a state of stupor: this continued about an hour. Four hours after the bite, he appeared to be recovered.

Experiment 5th. The same reptile, after having bitten another dog, pierced a fowl in the thigh, which had been previously rubbed with oil. At the end of a quarter of an hour, the animal began to be dejected, and moved with difficulty. These symptoms increased, and it expired an hour and twenty minutes after the bite. It had no convulsions.

Another fowl was bit, without any oil being previously applied. Seeing, at the end of four hours, that it exhibited no remarkable symptom, it was caused to be bit a second time. It survived two hours after the wound, and died likewise without convulsions. It was soon ascertained, by several experiments, that the application of oil to the part bitten did not prevent the effects of the venom.

Experiment 6th. In the month of November, a great dog was bit in the thigh by the *Male Nagoo*, a variety of the *Vipera Naja*. The animal experienced the symptoms described above, and expired fifty-six minutes after.

A very strong dog, bitten at two different times by the same reptile, lay down on the side, experienced a trembling in the muscles of the thigh, and was perfectly restored at the end of eight hours.

The bite of the *Arege Nagoo*, another variety of this species, produced the same symptoms in a robust dog, who died three hours after.

Experiment 7th. A very strong dog was bit in the thigh by a *Cobra de Capello*, that had lost its two longest teeth. Immediately after, the animal complained greatly; nevertheless, the limb was not drawn up, and there was no apparent symptom a quarter of an hour after. At this moment, he made his escape, took a long run, and could not be brought back for an hour and half after; he was extremely fatigued, and very much heated; he refused water a quarter of an hour

after; but he ate some bread soaked in this fluid. At the end of fifteen minutes, he vomited, barked, and appeared uneasy. The vomitings were repeated at the end of ten minutes, and the animal became furious; he beat himself about in order to effect his escape, endeavoured to break the post to which he was tied, and barked continually. He lay down after the second vomiting, and appeared to experience a great agitation of the abdomen and stomach; the muscles of the face were agitated with convulsive movements; his extremities were not paralyzed, and he was able to walk: towards the end of the third hour, he was so furious, that it became necessary to tie his legs. From that moment the agitation and howlings diminished, but the convulsive movements in the face continued. This state continued about an hour, and he expired. The part bitten was almost black for about the size of a half-crown piece.

This experiment presents two remarkable phenomena; viz. the non-appearance of the local symptoms before the running, and the backwardness of the appearance of these symptoms, which were not perceived till two hours after the bite.

Experiment 8th. Several fowls were bit by the *Cobra de Capello*. Oil of vitriol (sulphuric acid) was applied to the wound: they died much sooner than others which had been bitten at the same time, and on whose wounds no such caustic had been applied.

Experiment 9th. A pig was bit on the inside of the thigh by a *Cobra de Capello* which had been kept shut up for six weeks, and to which nothing had been given but some milk once a week. There was no sensible effect during the first ten minutes: then the animal lay down, and appeared to be affected: he uttered no complaint. Ten minutes after, his breathing became laborious, and he kept himself lying down on the side. He remained in this position for a quarter of an hour: then he was seized with convulsions, and expired about an hour after having been bit.

Experiment 10th. A *Cobra de Capello* known at Ganjam under the name of *Satanag*, bit another variety of *Cobra*, which did not appear to feel any effect from this bite: indeed, the marks of the teeth could not be perceived.

The *Coodum Nagoo* bit another reptile, known by the name of *Coultiab*, in the belly. The wound bled, and there was no other apparent phenomenon. The *Tartutta*, bit immediately after by the same reptile, in the same part, died at the end of two hours.

Experiment 11th. A number of fowls and pigeons were bit with impunity by the *Cobra de Capello*, which had been deprived of his teeth; but, when the venom of this reptile was procured, and applied to these same birds, whether by pricking them, or by incision, they died after having experienced all the symptoms of poisoning.

Experiment 12th. An incision was made in the inside of the thigh of a dog; and a certain quantity of the venom of the *Cobra de Capello* was introduced into the wound by means of the handle of a scalpel and a little lint: the animal was prevented from licking the wound. He did not appear to feel any decided effect; but as he lost a considerable quantity of blood by the wound, it is to be presumed that the experiment was not well made.

Experiment 13th. Several wounds were made in the inside of the thigh of a strong dog, and to each them was applied some of the fresh venom of the *Comboo Nagoo*, a variety of this species; the other thigh was pricked in several places by pins envenomed with the same poison. These punctures were deep, and penetrated the muscles. No symptom followed.

The same experiment was repeated with this poison inspissated by exposure to the air. It furnished the same results.

Experiment 14th. Some of the same venom was applied several times to the thigh of a number of fowls, both by incisions, and by punctures. There did not result from it any serious symptom, notwithstanding that these animals die in a

few minutes where they have been bitten by the serpent. A pigeon died seven hours after having been punctured in the muscles of the thigh by an envenomed lancet.

Observations.

1st. In the month of January, 1788, a woman of Malabar was bit in the lower part of the leg by a *Cobra de Capello*. *M. Duffin* saw her two hours afterwards. She had lost the faculty of seeing and feeling; the deglutition was so difficult, that it would have been impossible to have introduced any thing into the stomach; there was no spasm in any other part of the body; but since the accident, all the systems had been plunged into a state of torpor, which continued to increase. With some difficulty they succeeded in making her swallow one of the pills of *Tanjore* (for the composition of these pills, see the article *Treatment)*; the wound was dilated, and mercurial ointment applied to it. Three hours after, a second pill was administered, which, like the first, produced no effect; lastly, a third was given her several hours afterwards, which produced alvine evacuations, and a slight moisture of the skin. Eighteen hours after the bite, the patient recovered the power of seeing and swallowing. During the three days which followed, a pill was given every morning, which occasioned nauseas, and increased the perspiration. The patient continued weak for eight or ten days, and in the end recovered.

2nd. An Indian was bit on the ancle by a large *Cobra de Capello*. At the end of a quarter of an hour, his jaws were locked together, and he appeared to be dead; the part bitten exhibited four very large punctures, to which was applied some *eau de luce*. Immediately, the patient gave signs of feeling, and drew up the leg. Two bottles of Madeira wine were heated, and he was made to swallow them, by forcibly separating the jaws, and introducing a funnel into the mouth. Almost the whole of the fluid went into the stomach. Half an hour after, the *eau de luce* was continued to be externally

applied for the space of three hours. The patient was so insensible, that he might have been thought dead if he had not breathed from time to time. This state continued forty hours, after which time, he appeared to recover his feeling. It was not till twelve hours after, that he began to speak, and he continued for several days weak and languid. The Madeira wine appears to have been here, as in a great many other similar cases, an heroic remedy; at least, the cure of the disease must not be attributed to the *eau de luce*. *(Russel.)*

3rd. In the beginning of June, 1788, after sun-set, a man forty years old, was bit in the fleshy part between the thumb and fore-finger by a *Cobra de Capello*. He experienced instantly a severe acute pain in the part bitten, which in a short time extended to the top of the arm; he experienced nauseas, but did not vomit. In less than an hour the hand and wrist were considerably swelled, the shoulder of the same side was very painful, the head heavy, accompanied with a great tendency to sleep, so that he passed several hours without being able to judge of his condition; but it was ascertained that he had been at one time, extremely uneasy, without making any complaints; at another, he suffered pain, and fell immediately again into a state of somnolency. The symptoms increased in intensity towards midnight; he had convulsive movements in the throat; his breathing became painful; he could no longer speak or see, although his eyes were open. A cataplasm composed of several different herbs had been applied to the arm, and a secret antidote had been given him. At two in the morning, he was much better; he had recovered the exercise of his senses; his arm was excessively tumefied. In the course of the day, the symptoms had diminished in a singular manner. He was made to take a few doses of Peruvian bark: the back and palm of the hand, as well as the wrist, were in a state of gangrene; the tendons were laid bare, and there resulted a large ulcer, which was cured by

the ordinary remedies. The patient had recovered his health ten days after, but was not able to use the hand for several months.

OF THE *VIPERA ELEGANS* OF DAUDIN (*COLUBER RUSSELIANUS, KATUKA REKULA PODA* OF THE INDIANS).

Experiment 1st. On the 17th of October, 1787, a fowl was bit in the wing by this reptile. It experienced instantly convulsions, and expired thirty-eight seconds after. The dissection of the body discovered no alterations.

Experiment 2nd. Immediately after, the same animal was made to bite the thigh of a robust dog. Five minutes were scarcely elapsed, when he appeared stupified; the limb was drawn up, and he moved it about frequently, as if it had been in pain. He remained however on his feet, and ate some bread which was offered him; he had one stool. Ten minutes after the bite, the thigh began to be paralyzed, and in five minutes more, it no longer performed its motions: the animal lay down, uttered horrible cries, frequently licked the wound, and made at intervals fruitless efforts to rise. At the end of four minutes, he began again to bark, and moaned frequently; the breathing became difficult, and the jaws were strongly locked together: he then experienced alternately symptoms of agony and stupor, and died twenty-six minutes after the operation. After death, blood flowed from the mouth and nose. The parts in the neighbourhood of the wound were very much inflamed.

Experiment 3rd. The inside of the fore thigh of a rabbit was deprived of the skin, and bitten by the same reptile (which had already bit four other animals). Immediately the thigh was drawn up; nevertheless, the animal attempted to walk. Thirty-five minutes after, he had convulsions, lost the power

of standing, and was affected at intervals with a universal trembling. He died an hour after the bite.

The same reptile bit, the same day, for the sixth time, a fowl, which died at the end of six minutes.

Experiment 4th. On the 13th of March, 1788, a great dog was bit by a *Rekula Poda* which had been shut up for twelve days without eating. One of its teeth accidentally touched the scrotum, and drew blood; the other was slightly applied to the thigh. No symptom made its appearance during the first hour; then the scrotum and genital parts swelled considerably, but the thigh was not drawn up. During the third hour, the animal was plunged into a state of coma; he was no longer able to keep his feet, and the wounded limb was paralyzed. The symptoms went on increasing; the animal lay down in a state of great insensibility; his breathing was painful; but he uttered no cry. Eight hours after, he breathed with the greatest difficulty. This state of languor continued two hours longer, after which, he died without convulsions. The wounded parts were considerably swelled.

Experiment 5th. A horse was bit on the lateral parts of the nose by a *Katuka Rekula*. The bite on the right side was deeper than that on the left. A quarter of an hour after, the right side was slightly tumefied and discoloured; a great quantity of fluid matter flowed from his nostrils. Ten minutes after, the face and throat were very much swelled. Some hay was offered to the animal, which he rejected on account of the impossibility of chewing or swallowing it. Forty minutes after the bite, the lower lip was agitated by convulsive movements, which lasted till night; the eyes were covered with a glutinous matter, and the nose continued to discharge profusely. During the second hour, the horse appeared more affected; the tumefaction increased, principally in the throat and in the lower lip: he refused food; but the breathing was not so difficult, as apparently it ought to have been from the suppression of the discharge which flowed from the nostrils.

The swelling increased during the night. The next morning, the animal was in the same state, unable to eat or drink. Emollient applications were had recourse to, which diminished the tumefaction, and in the evening, he was able to eat. On the third day, the animal could support himself, and was perfectly recovered two days after.

Experiment 6th. An incision was made on the inside of the thigh of a dog who had been bitten with impunity two hours before, by the *Katuka Rekula Poda*. A piece of lint, soaked in the venom of the same reptile, was introduced into the wound. The animal did not experience any remarkable phenomenon; the wound was perfectly healed a few days afterwards. The venom of the serpent nevertheless, preserved its strength, since it produced, in the course of a minute and a quarter, the death of a fowl bitten by it immediately after the incision was made in the thigh of the dog.

Experiment 7th. A hollowed fang made in imitation of the tooth of the serpent, was introduced into the muscles of both thighs of a strong dog, which contained a drop and a half of the venom of two individuals of the species of the *Katuka Rekula Poda*. The dog appeared to lose the use of his limbs; he was dejected, moaned, and lay down: the parts in the neighbourhood of the wounds became swelled; but the next day he was recovered.

Experiment 8th. A piece of lint, soaked in the venom of one of these reptiles, was applied near the groin of a weak dog. The operation was performed after the manner of a seton. In a short time after, the limbs were slightly affected; but the animal was perfectly recovered at the end of a few hours.

The experiment was repeated by diluting the venom with a little rum: the effects were the same.

Experiment 9th. The poison of this reptile was brought in contact with the thighs, the neck, and the breast of several fowls, sometimes by making incisions, sometimes by punctur-

ing them, sometimes by applying lint dipped in the venom. It was also brought in contact with the breast and thighs of several pigeons ; none of these animals experienced any serious symptoms ; but the fowls sometimes died on being punctured two or three different times, by a hollowed fang containing fresh venom, in the different fleshy parts of the pectoral muscles. It was well ascertained, by repeated experiments, that the diversity of effects of this venom did not depend on the thickness which it acquired from the contact of the air. The author of these experiments had been of opinion, for some time, that the symptoms did not take place in some of these animals, because they had lost some blood, and that the poison had been expelled ; but other data caused him to renounce this opinion ; so that he does not attempt to give any explanation of the cause of the difference in the results which he has obtained.

Experiment 10th. The biceps muscles of several fowls were punctured at different times, with a lancet impregnated with the same venom. They died at the end of three or four minutes.

992. It results from these experiments,

1st. That the venom of the *Katuka Rekula Poda*, which is excessively dangerous for dogs when applied by the bite of the animal, is scarcely at all so when introduced by an incision.

2nd. That fowls and pigeons, which uniformly die after the bite of these serpents, sometimes survive the insertion of their venom into an incision ; and even feel but very slight effects from it ; but that nevertheless they may die from the consequences of this artificial insertion, without our being able hitherto, to assign any cause for this difference.

OF THE *COLUBER GRAMINÆUS* OF SHAW (*RODROO PAM* OF THE INDIANS).

Experiment 1st. On the 14th of October, 1788, the thigh of a fowl was caused to be bitten by this reptile: it was immediately drawn up, and the animal had a stool. Two minutes after, it lay down: it was placed on the feet, and was unable to support itself. Five minutes after the bite, it was agitated by convulsive movements which became very strong, principally in the head and neck; to which succeeded, at the expiration of two minutes, all the symptoms of stupor. Death took place eight minutes from the beginning of the operation. The skin covering the bitten part was dissected, and a black line of about an inch long was observed, which extended towards the groin, and which, on being cut into, furnished blackish blood.

Experiment 2nd. The same day, a pig was bit in the fore foot by the same reptile: the hairs had not been removed. Seven minutes after, the animal was sensibly dejected, and fell into a state of stupor a quarter of an hour after the bite. This state continued to the end of the second hour; the animal was not able to rise, and uttered plaintive cries when placed on his feet. During the third hour, the symptoms appeared to increase; he complained from time to time, and fell quickly again into a state of stupor. These symptoms began to diminish two hours afterwards, and the animal attempted to walk. He was perfectly recovered seven hours after the bite.

Experiment 3rd. Another fowl was bit by the same reptile half an hour after the bite of the pig. It experienced slight convulsions, and died at the end of thirty-three minutes.

Experiment 4th. On the 20th of October, a dog was caused to be bitten by the same reptile. Sixteen minutes after, he had a trembling of the head, and of the anterior extremities. He was placed on the feet, and made a few steps with-

out staggering. Five minutes after, the trembling increased, and the thigh was contracted. Fifty-five minutes after the bite, the trembling was general, and the animal extended his neck; his mouth was directed upwards, and performed the movements of yawning as if he was making efforts to respire; but he uttered no plaintive cries. During the second hour, he lay down on the side, in a state of torpor; but he twisted his limbs at intervals, and had from time to time *subsultus tendinum*. These symptoms diminished after the third hour, and he recovered in a short time. Two days after, he was again bit in both thighs by the same reptile, which had bit in the interval three fowls. The animal experienced the same symptoms, and was recovered in the course of three hours. It was imagined that the venom must have lost its strength after so many bites. In order to be assured of that fact, a fowl was caused to be bitten, which did not die, although it was for two hours under the influence of the poison.

993. These facts go to prove, that the venom of this reptile is not so fatal as that of the *Cobra de Capello*, and of the *Katuka Rekula Poda*.

994. There are beside a great number of species of the same genus *Vipera* which are venomous; we shall here enumerate them.

The *Vipera Chersea* of Linnæus (*Æsping* of Sweden). It inhabits the northern countries of Europe. Linnæus relates, that a woman was bit by this reptile, and died in a very short time. (Amœnit. Acad. Vol. VI. p. 214.) The Viper of *Redi*; the black Viper (*Coluber Præster* of Linnæus); the *Vipera Cleopatra (Haje), Ammodyte, Scythian, Cerastes*; the *Vipera Ocellata* of Latreille and Daudin; the *Vipera Lebetina lance-head*, with the head triangular, *Hebraica, Atropos, Dipsas, Severa, Stolata, Corallina, Atrox* (which the Portugueze call *Cobra de Capello)*; the white Viper (*Nivea), Brasilian, Lobéris Tigrina, Lactea*, and *Hæmachates*.

OF THE *GÉDI PARAGOODOO* OF THE INDIANS (*BOA* OF RUSSEL).

Experiment 1st. In the month of August, 1788, a great strong dog was bit in the thigh, near the groin, by one of these serpents, which was kept there for more than twenty seconds; but the skin appeared only to have been scratched: there was seen at the place of the wound only a small quantity of blood, and a little venom. The dog cried out at the moment of the wound, but he walked about freely an instant after. At the end of two minutes, he passed urine; the wounded limb was a little drawn up; however, the animal was able to keep on his feet. Five minutes after, he lay down and barked; the motion of the thigh was sensibly weakened, although the animal could still stand. Twenty-five minutes after the bite, the posterior extremities were paralyzed. In the course of the second hour, the disease made some progress; the animal vomited more than once, became more and more benumbed, lay down on the side, and panted for breath. He died at the end of the second hour, and had scarcely any convulsions. The part bitten was examined four hours after; it was scarcely tumefied or discoloured; which is scarcely ever observed in the bite of other venomous reptiles.

Experiment 2nd. A fowl was bit in the groin by this serpent. A short time after, it fell into a state of stupor; nevertheless, it was able to walk about, and to stand up. At the end of ten minutes, it was no longer able to support itself. Five minutes were scarcely elapsed, when it lay down, and appeared to be asleep. For some minutes, it made, at several different times, fruitless efforts to rise, moving its head from side to side. A short time after, it had slight convulsions, and expired half an hour after having been bitten. The part wounded was not discoloured; but the comb, and the sides of

the mouth were of a dark red colour. The beak and some of the claws were of a livid colour.

Experiment 3rd. A small bitch was bit in the groin by this reptile. At the end of a quarter of an hour, only a slight weakness of the limbs had been perceived. Fifty minutes after, the animal lay down on the side, and appeared to be worse: her posterior extremities, especially that which had been bitten, were paralyzed. An hour after the bite, she vomited, had convulsions for ten minutes, and expired.

OF THE *BUNGARUM PAMAK* OF THE INDIANS, AND *SACKEENE* OF BENGAL (*BOA* OF RUSSEL).

Experiment. A fowl was caused to be bitten by this reptile. The animal shortly after lay down, passed two stools, and was no longer able to stand; it made fruitless efforts to rise during the first ten minutes, and experienced a trembling of the head. Five minutes after, it appeared to be on the point of dying; the convulsions shortly made their appearance, and it died twenty-six minutes after the bite. It is probable that this animal would have died sooner, if the serpent that bit it had been in full vigour.

Observations.

Russel relates beside some observations in which the persons died in consequence of the bites of serpents, the names of which he does not mention.

1st. A man fifty years old, was bit by one of these animals in the small toe of the right foot. He felt at first only a pain similar to what a large ant would have produced, and went and lay down. Eighteen hours after, he was found almost stiff, and said that death appeared to him inevitable; he did not suffer much pain, but was in a state of stupefaction; he lost the faculty of seeing, and expired two hours after.

2nd. The same serpent bit, nearly at the same time, the inside of the left wrist of a soldier. This man experienced little pain, but fell into a state of drowsiness, and lay down to sleep. He was woke eighteen hours after; he laboured under a dimness of sight, and was recommended to walk about. On examining the wrist three hours after, two small punctures were perceived at the distance of the eighth of an inch one from the other. Two hours afterwards, he could no longer see, and complained principally of being hindered from sleep. He lay down, and expired an hour and half after, without having had any convulsions. The bodies of these two persons began to putrefy four hours after death. The Indians give the name of *Min Naig Paum* to the serpent which was the cause of these accidents.

3rd. A young servant girl, terrified by some antecedent circumstance, was bit by a serpent. She complained loudly, and was utterly incapable of giving any account, a few moments after, of what had happened to her: she expired at the end of ten minutes.

The following are the conclusions drawn by this enlightened traveller, *Russel*, from the preceding facts:

1st. The different reptiles mentioned above, are all venomous, but in different degrees.

2nd. The symptoms produced by them in the different animals are nearly alike, appear nearly in the same order, but with greater or less rapidity: in general, their invasion takes place from the third to the tenth minute; they rarely exceed half an hour.

3rd. When the reptile has been lately caught, its bite is more deleterious than when it has been kept some time; nevertheless, it does not lose entirely its poisonous qualities, even when kept shut up without food. In this case, if it has not the strength necessary to kill a quadruped somewhat robust, it preserves the faculty of destroying fowls, pigeons, &c.; though indeed, with less energy than if it had been recently caught.

4th. When the same reptile is made to bite several times in the same day, the first is always the most deleterious, every thing else being equal.

5th. The poison of these reptiles does not always kill animals: there are even some that recover after having been a prey to fatal symptoms. In general, the danger they incur, is in proportion to the intensity, and the speedy appearance of these symptoms.

6th. The period of death varies considerably. Dogs do not die so speedily as birds: this difference does not appear to depend on the size of the animals.

7th. There is much less certainty of producing the symptoms of poisoning, by applying the venom to an incised part, than in causing the animals to be bit by the serpent, but, in those cases where they do take place, they are identically the same, and equally fatal to small animals.

OF RATTLE-SNAKES.

995. These serpents constitute a genus, known under the name of *Crotalus*, in which are reckoned eight species, viz. the *Crotalus Boiquira*, the black-tailed *Crotalus*, the *Crotalus Durissus*, the lozenged *Crotalus*, the *Crotalus Dryinas*, the *Crotalus* without spots, the flat-nosed *Crotalus*, and the millet *Crotalus*.

Characters of the Genus. The superior jaw exhibits one, and sometimes two enormous fangs, or teeth of greater strength, frequently six lines and more in length, and contained in a sort of bag or membranous sheath, from which they start out when the animal raises them. It is here, under the skin, which covers the jaws, that the poison bags are placed. It insinuates itself into the fang, and issues out by a longitudinal slit, which is seen on the inner side, a small distance from the point. Transverse marks, or bands, underneath the body, and

underneath the tail, which is terminated by one or several hollow pieces of a shelly consistence, and sonorous. *(Bosc.)*

It is well known how much the history of these serpents abounds in fabulous recitals, to which we do not wish to recall the attention of the reader; our object here, is not to re-produce all that has been written of the marvellous concerning the instinct, habits, and other particulars relating to these reptiles: these details are the province of Natural History and Physiology: we shall therefore confine ourselves to the proving, that the bite of these serpents is extremely dangerous, and point out the principal symptoms produced by it.

Observation.

Thomas Soper, twenty-six years of age, of a weak constitution, was bit on the 17th of October, at half past two o'clock, twice in succession, on the first phalanx of the thumb, and twice on the side of the second joint of the fore-finger, by a Rattle-Snake of four or five feet long. A doze of jalap was administered to him very soon after, and some drugs were applied to the wound: the hand swelled up, and the patient, greatly terrified, was admitted to St. George's Hospital at three o'clock. The wristband of his shirt had been opened, and the swelling extended half way up the fore-arm: the skin of the back of the hand was very tense, and extremely painful. At four, the tumefaction had extended to the elbow; and, at half past four, half of the arm was already swelled; the pain extended to the axilla. *M. Brodie,* who first visited the patient, discovered that the skin was cold; the pulse was beating a hundred strokes in the minute; his answers were incoherent, and he had an inclination to vomit. Forty drops of pure fluid ammonia, and thirty drops of sulphuric ether, in an ounce of camphor mixture, were administered to him; the patient immediately vomited this draught; pure ammonia was applied to the wound, and upon the arm and fore-arm were applied

compresses, moistened with camphorated spirit of wine. At five, he took two drachms of the compound spirit of ammonia, thirty drops of ether, and an ounce and half of camphor mixture; this draught was not vomited. At six, the pulse was stronger: he was very weak at half past seven *(thirty drops of ether, and the same quantity of ammonia in water).* This dose was repeated at half past eight. At nine, he felt himself sinking greatly. The skin was cold, the pulse, which was feeble, beat only eighty strokes in the minute. The same medicines were again given to fifty drops, and were afterwards repeated. At a quarter past ten, the pain of the arm was extremely acute, the pulse stronger; but the patient fell into a fainting fit every quarter of an hour. In this state, the pulse became imperceptible; but, during the intervals, his mind was not extremely depressed. He had two stools in the evening. *M. Everard Home* saw him for the first time at half past eleven. The hand, wrist, fore-arm, arm, shoulder, and axilla, were excessively tumefied; the arm was almost cold, and it was impossible to perceive the pulsations in any part of it, without even excepting the site of the axillary artery: the wounds of the thumb were not very visible; those of the fore-finger were remarkably apparent: the skin was extremely cold. They endeavoured to tranquillize him with respect to his situation, and he said, that he hoped to recover. On the 18th, at one in the morning, he spoke in a confused manner; his pulse beat a hundred strokes in the minute; the faintings were frequent. The same medicines were given him every hour. At eight in the morning, his pulse was extremely weak, and beat a hundred and thirty-two strokes in the minute. The swelling had not gained upon the neck; but there was a fulness along the side; the blood was extravasated under the skin as far as the lumbar region, which gave to the right side of the back a party-coloured appearance; the whole of the arm and hand was cold and painful on pressure; the skin was extremely tense; there were pustules on the inside of the arm,

below the axilla, and near the elbow; above each pustule, the skin exhibited a red spot, the size of a crown piece; it had in general recovered its heat; the patient was extremely weak and dejected; his lips trembled, and the fainting fits were renewed nearly in the same manner as in the preceding evening. The last dose of the medicine had been thrown up; but he kept on the stomach some hot wine, which had been given him at noon. He had some convulsive movements in the limbs; the whole skin of the arm appeared livid, similar to that of dead bodies which begin to putrefy; there was a fluctuation below the skin of the external part of the wrist and fore-arm, which determined the medical attendants to puncture it with a lancet; there flowed out a small quantity of serous fluid. The same medicines were continued till eleven at night; but perceiving that they were frequently vomited, he was ordered two grains of opium every four hours. The pulse was scarcely perceptible at the wrist; the faintings were not less frequent; the pustules and spots had increased in size.

19th *October*. At nine in the morning, his pulse was hardly perceptible, the extremities cold, the pustules increased in size, and the arm diminished in bulk. He was extremely drowsy, which probably was the consequence of the opium. He had taken nothing during the night but brandy. At three in the afternoon, he was still more sunk, and spoke very slow; the pustules were still larger; the faintings less frequent; the size of the arm was diminished, and he recovered the sensation in the fingers. At eleven in the evening, his pulse beat a hundred and thirty times in the minute, and was small. The opium was suspended, and he was evacuated by means of a glyster. He was ordered beside, for his drink, camphor mixture, brandy, and wine.

20th *October*. He had been very drowsy at intervals during the night; his intellectual faculties were in a better state, and his extremities warmer. At nine, he took some coffee for breakfast; some little time after, he ate some fish which he

threw up again. He then took nothing else but brandy and coffee in the dose of half an ounce at a time, because they were always vomited when taken in larger quantities.

21st *October*. He slept from time to time during the night; but had some delirium; his pulse beat a hundred and twenty in the minute; his stomach was not able to retain any thing but brandy and jelly. The size of the arm was sensibly diminished; but the skin was extremely tense.

22nd *October*. He had slept almost the whole night; his pulse beat ninety in the minute. He ate some veal for dinner, and took a little brandy; the pulse became strong and full in the evening; wine was substituted for the brandy. The right side of the back was inflamed and painful towards the lumbar region, and had a party-coloured appearance, on account of the extravasated blood under the skin.

23rd *October*. The pulse continued full, and the arm extremely painful, although diminished in size; the abscesses had burst, and the skin was dressed with white ointment; some evacuations were procured by means of an aperient drink. He took some veal and porter for dinner: the wine was suspended. In the evening, a saline preparation was ordered for him, with antimoniated wine.

The next day, no alteration.

25th *October*. The frequency of the pulse was increased: he was evacuated.

26th *October*. The arm was more swelled and inflamed.

27th *October*. This inflammatory state had increased; the tongue was foul, and the pulse very frequent. He attempted to get up; but could not accomplish it, on account of the weight and pain of the arm. Spirit of wine and acetate of ammonia were applied to the arm.

28th *October*. The slough had begun to separate on the inner side of the arm, below the axilla, and diarrhœa had already taken place. A chalk mixture with laudanum was ordered for him. He had cold shivering during the night.

29th *October*. The diarrhœa was diminished: the pulse was weak, and beat a hundred in the minute. A large abscess was formed on the exterior part of the elbow; it was opened, and a quart *(chopine)* of a brownish red matter was discharged from it, in which floated some sloughs of the cellular texture. The inferior part of the arm became small, but the tension continued in the upper part: a poultice was applied over the wound. The lower part of the arm and the fore-arm was covered with circular straps of cerate. The bark was ordered for him, and he was allowed the use of wine and porter.

30th *October*. The redness and tumefaction of the superior part of the arm were diminished; the pulse beat a hundred in the minute. The patient had been again purged. The bark was suspended; he was made to take the calcareous mixture, with laudanum, and an opiated glyster.

31st *October*. The pulse beat a hundred and twenty in the minute; the suppuration of the abscess was diminished; the patient continued to be purged, and had a cold shivering in the night.

1st *November*. Pulse a hundred and twenty in the minute; voice feeble; he had no appetite, and was delirious from time to time. The ulcer was very extensive, he drank two pints of porter in the course of the day.

2nd *November*. Pulse extremely feeble, countenance sunk, tongue brown, the ulceration was of two or three inches in extent: the skin in the neighbourhood of the axilla was gangrened; he vomited every thing except the porter; the delirium continued the whole of the night.

He died on the fourth of November at half past four in the afternoon. The body was opened sixteen hours after, there was no visible external lesion, except in the arm that had been bitten: the skin was white, and the muscles contracted. The wounds inflicted on the base of the thumb were cicatrized, but the puncture of the wrist was still open: the skin was in a state of gangrene throughout a great part of

the arm and fore-arm; it was still adhering to the flector muscles of the fore-arm, by means of a portion of cellular texture, which was of a dark colour. In the other parts of the arm, fore-arm, and axilla, it was separated from the muscles by means of a dark coloured fluid, of a fetid smell, in which were swimming some sloughs formed by the cellular texture; the muscles were in their natural state, except near the abscess; the lungs did not appear to be altered; the surface of the pericardium corresponding to the sternum was dry; there was in the cavity formed by this membrane, half an ounce of a serous fluid, mixed with some bubbles of air; the blood contained in the ventricles of the heart was coagulated; the cardiac portion of the stomach was a little distended by a fluid; that which corresponds with the pylorus was very much contracted; the vessels of the mucous membrane of this viscus were exceedingly dilated by blood. The intestines exhibited no alteration; the gall-bladder contained a great quantity of bile, which appeared not to be altered. The lacteal vessels and thoracic duct were empty, and in their natural state; the vessels of the *pia mater* and brain were distended with blood; the ventricles of this organ contained a greater quantity of serosity, than in their natural state; there was also an effusion into the cells, which unite the *pia mater* to the arachnoid membrane. This alteration of the brain and its membranes, is frequently met with in acute diseases which have proved fatal.*

M. Everard Home, who has collected a number of facts relating to the bite of different venomous serpents, is of opinion, 1st. That when the venom is extremely active, the local irritation is so sudden and violent, and its effects on the animal economy so severe, that the animals die in a very short space of time: in that case no alteration is found except in the parts bitten: the cellular texture is entirely destroyed, and

* Philosophical Transact. for the year 1810, part 1st, p. 75. Read December 21st, 1809, by Everard Home, Esq.

the muscles are very much inflamed; 2nd. That when the poison is less intense, its action is not always fatal; nevertheless there is a slight delirium, and considerable pain in the part bitten. About half an hour after, a swelling takes place, which depends on the effusion of serosity into the cellular texture, which continues to increase with greater or less rapidity for about twelve hours, and which extends into the neighbourhood of the affected parts; the blood ceases to flow in the smaller vessels of the parts that are tumefied; the skin which covers them grows cold; the action of the heart is so feeble, that the pulse can scarcely be felt; the stomach becomes so irritable, that it can scarcely retain any thing. About sixty hours after, these symptoms have acquired a greater degree of intensity; inflammation and suppuration take place in the injured parts; and, when the abscess is very considerable, the patient expires. When the bite has been inflicted on the finger, this part sometimes becomes gangrenous immediately. If death happens under one of these circumstances, the absorbent vessels and their glands do not experience changes similar to those produced by the *virus*, and there is no alteration except in the parts which have some connexion with the abscess. In general, the symptoms which take place in these cases proceed more rapidly than those which depend on a *virus*. This consideration, joined with the grievousness of the symptoms which take place at first in those persons that recover after having been bit, has induced the opinion that their cure was attributable to the medicines employed: it is for this reason, for instance, that the *eau de luce* is regarded in the East Indies, as a specific against the bite of the *Cobra de Capello*. 3rd. That this opinion appears to have no foundation; for death takes place whenever the poison is very active, and every time it produces a very extensive local injury; whilst recovery attends all slight wounds. The effects of the venom on the constitution are so instantaneous, and the irritability of the stomach so great, that it is

not possible to administer any medicines until the symptoms are fully developed, and then there is little chance of success.*

OF INSECTS.

OF THE SCORPION.

996. The sting of the Scorpion produces on the human species, symptoms which vary according to the size of the animal, and the climate to which it belongs: in general, it is much more dangerous in southern countries than in others.

1st. *Bontius* affirms, that the great Scorpion of the Indies produces madness in such persons as are stung by it.

2nd. *Mallet de Brossiere* saw at Tunis two persons, who, having been stung by a great Scorpion, experienced very grievous symptoms, which yielded only to the employment of the volatile alkali. (*Société Royale de Médecine*, tom ii. p. 315.)

3rd. An adult man, of Montpellier, was stung by a Scorpion at the bottom of the left thigh. He was at first less sensible to this sting than to that of a bee. The next day he experienced great tension, with sensibility up to the middle of the thigh, attended with an erysipelatous redness. The place of the sting was of a deeper red, bordering on black, from four to five lines in diameter, and without any regular form. There was no effusion of blood; the symptoms continued six or seven days, and disappeared of their own accord, without having had recourse to any other application than that of saliva. The brown spot remained about a fortnight. (*Notice des Insectes de la France réputés venimeux*, par Amoureux, 1789, p. 199.)

* Philosophical Transactions for the year 1811, by Everard Home, part i. p. 75.

4th. The celebrated *Maupertuis*, who made a great number of experiments on this subject, has proved that the sting of the Scorpions of Languedoc may prove fatal, but that it happens very rarely. Out of a very great number of dogs and fowls, bit by these insects, there only died one dog, who had received under the belly three or four stings from an irritated Scorpion. He became very much swelled an hour after having been stung; he staggered, vomited all that was contained in the *primæ viæ*, fell into convulsions, bit the ground, dragged himself along on his paws, and expired at the expiration of five hours. (*Academie des Sciences*, année 1731.)

5th. *Matthiolus* asserts that the Scorpions are venomous in Etruria, that they are less so in the rest of Italy, and not at all so in the territory of Trent.

M. Amoreux, who has written an excellent work on venomous insects, after having collected various observations of stinging by Scorpions, is of opinion, that the symptoms which they most frequently occasion may be reduced to the following: a red mark which increases a little, and grows slightly black towards the centre, and which is commonly followed by pains, inflammation more or less considerable, swelling, and sometimes pustules; some persons experience fever, cold shiverings, and numbness: vomitings have sometimes been observed, and singultus; pains all over the body, and tremblings.

OF SPIDERS.

997. If credit is to be given to the writings of *Turner*, *Lister*, *Scaliger*, *Flacourt*, *Brogiani*, and others, Spiders ought to be ranked amongst the most venomous of animals; on the other side, *Hoffman*, *Bon*, *Robert*, *Boyle* contend that there is nothing hurtful in them, and that they may be swallowed with impunity. *M. Amoreux* assures us that the sting of the large Spiders of France is little apparent; that there forms round the part punctured a swelling of a livid colour,

sometimes with *phlyctænæ,* which seem to indicate a septic venom. He is of opinion that the other grievous symptoms described by authors are infinitely exaggerated.

OF THE TARANTULA.

998. This insect has been the subject of a multitude of fabulous recitals, engendered by ignorance and superstition. Nevertheless some respectable authors, amongst whom we shall notice *Baglivi,* have written at length on the effects it produces. We read, in some amongst them, that the bite of the Tarantula is capable of producing a slow fever, of which the patient cannot be cured but by dancing beyond his strength, to the sound of a drum or some sonorous instrument; on which account, unfortunate wretches have been seen, all decorated with flowers and ribbons, like victims, traversing the public places in the hottest part of the day, dancing bareheaded, with their faces turned towards the sun, until the total exhaustion of their strength plunges them into a state of profound lethargy: then their relations carry them off on a couch, and the music is continued a long time after they have ceased to hear it. Other authors pretend to have seen all the symptoms of *ataxic* fever discover themselves, in consequence of the bite of this insect.

M. Serrao, Chief Physician to the King of Naples, has undeceived the public, already too long abused by the appearances of the marvellous. A man allowed himself to be bitten by a Tarantula, in presence of the Polish Count de Borch; there followed only a little tumefaction in the hand and fingers, and a tolerably strong itching. *(Amoreux.)* *M. Pulli* has ascertained that the *Tarentism* is frequently a feigned disease; such is the case with respect to that woman, rendered fanatic by a superstitious ecclesiastic, and who could only be cured by dint of threats and ill treatment. (ALIBERT, *Elements de Therapeutique,* tom. ii. p. 506, 3rd Edit.)

Epiphanius Ferdinand declared in 1621, that during the twenty years he had practised medicine at Naples, he had never seen any one die of the sting of the Tarantula; but he maintained the opinion that Tarentism was not a feigned disease.

The opinion of the enlightened is, that the sting of the Tarantula does not produce any extraordinary phenomenon, and that its effects are rather local than general. Nevertheless, it is much to be wished that a regular series of experiments on this subject should be set on foot.

OF THE BEE AND THE HUMBLE-BEE.

999. Every one knows the dangers arising from the sting of certain Bees. The few facts detailed below, may serve to make known the symptoms to which they give rise.

1st. A peasant about thirty years of age was stung by a Bee a little above the eyebrow; he fell instantly to the ground, and died a few moments after. His face was inflamed, and a very profuse hæmorrhage from the nose took place after death.*

2nd. *Zacutus* has seen the sting of a Bee followed by gangrene of the part.

3rd. *M. Amoreux* says, "the sting of a Bee is nothing of itself; but if these insects should assail either a man or an animal, in a swarm, they may cover him with wounds and destroy him, as well by the quantity of venom they introduce into his body, as by lacerating him."†

4th. *Swammerdam* and *Ludowic* tasted a little of the venomous fluid contained in the vesicle of the Bee, and they experienced on the skin and on the tongue the same sensation as is produced by aqua fortis *(Nitric Acid)*.

In general the sting of the Bee is followed by a severe pain,

* *Observation de M. Debrest, Journal de Médecine,* Août, 1765, p. 153.

† Op. Citato, p. 248.

and an erysipelatous tumefaction, very hard in the middle, which looks white, and continues as long as the sting remains in the wound.

OF THE HUMBLE-BEE.

M. Amoreux asserts that this insect is more to be feared than the Bee. In 1679, several persons in Poland were stung by large Humble-Bees, and there took place in them an inflammatory tumor which made a rapid progress, and which could only be stopped by making deep scarifications.

OF THE WASP AND HORNET.

1000. The sting of Wasps may also become fatal.

1st. A gardener of Nancy having put into his mouth an apple, in which was enclosed a Wasp, he was bit by it in the palate, near the *velum palati*, which produced a sudden inflammation and painful swelling, which, having intercepted the respiration, put a period to the unfortunate man's existence in the course of a few hours.*

2nd. *Lanzonus* speaks of a woman who was stung by a Wasp on the cheek, and who had an ulcer for three months in consequence of it.†

3rd. An English land-surveyor, says *M. Chaumeton*, had the satisfaction of saving the life of one of his friends, who was stung in the œsophagus by a Wasp, which he had not perceived in a glass of beer. He caused him to swallow, at several different times, common salt (muriate of soda) diluted with as small a quantity of water as possible, so as to form a kind of broth: the alarming symptoms, which had begun to

* *Gazette de Santé*, No. 45, p. 185. ann. 1776.

† Observation 188, tom. ii. Opera.

take place at the beginning of the accident, subsided almost at once, and disappeared as if by enchantment.*

M. Amoreux is of opinion, that the sting of Wasps and Hornets does not differ essentially from that of Bees and of Humble Bees.

Those of Wasps, he says, are much more sharp, and those of Hornets terrible. They are more or less severe, according to the part affected; according as the venom is in greater or less abundance; according as the insects are enraged or animated by the heat of the season and climate; lastly, when they have rested on venomous plants, on the bodies of animals that have died of pestilential diseases, and during contagious constitutions of the atmosphere. (*Op. Citat.* p. 250.)

5th. The celebrated *Reaumur*, in a very excellent paper on Wasps (*Académie des Sciences*, ann. 1719), assures us, "that when a person allows himself to be stung peaceably, the sting never remains in the wound. It is flexible; it does not make a very straight wound; the wound is curved, or in a zig-zag direction. If the wasp be forced to retire hastily, the frictions are strong enough to retain the sting, which is in some measure barbed; they tear it out from the animal; if, on the contrary, the insect be not hurried, it disengages it by degrees. The stings of the Hornet-Wasps are more sensible than those of the smaller kind."

1001. We might treat of other insects, the stings of which occasion symptoms similar to those we have just described; but we shall confine ourselves to the enumeration of them: the gnat, the gad-fly, the *mouche a scie*, the ichneumon, the tick, the *oestri*, the *scolopendra*, &c. &c.

* *Dictionnaire des Sciences Médicales*, article *Abeille.*

OF ANIMALS THAT PRODUCE GRIEVOUS SYMPTOMS BY THEIR INGESTION.

1002. This section comprises particularly certain species of fish, and muscles. There is in the Edinburgh Journal a paper of Dr. Chisholm on the poison of these fishes, from which we shall extract the principal results.*

CLUPÉ CAILLEUX-TASSART (CLUPÆA TRHYSSA OF LIN. *YELLOW BILL* OF THE ENGLISH).

1003. A negro of the dominions of the Great Mogul ate some of this fish: he had scarcely swallowed it, when he experienced horrible convulsions, and died half an hour after. The œsophagus and stomach were very much inflamed.

When the action of this fish is less violent, it produces an itching over the whole body, terrible gripings, a constriction and heat of the œsophagus, nauseas, great heat of the skin, acceleration of the pulse, vertigoes, loss of sight, cold sweats, insensibility, and death. The action of this fish is so rapid, that it has been often seen at *St. Eustatia* that persons have expired while still eating it. It appears, however, that its poisonous qualities depend greatly on the climate, since it is eaten with impunity at *Porto-Rico*.†

CORACINUS FUSCUS MAJOR (GRAY SNAPPER OF THE ENGLISH.)

1004. This fish acts principally on the intestines, and produces a *cholera morbus* accompanied with horrible pains; it

* Edinburgh Medical and Surgical Journal, 1st October, 1808. Tom. iv.

† Some other cause for this difference must be looked for than the climate; the two islands of St. Eustatia and Porto-Rico being almost in sight of one another, and nearly in the same degree of latitude.—TRANSLATOR.

produces likewise an itching on the surface of the body, the denudation of which it sometimes, though very rarely, effects, and the epidermis falls off as in certain species of leprosy. Its effects continue for a very long time, and there results from them a chronic disease distinguished by a great debility, and a paralysis of the inferior extremities, dimness of sight, and hardness of hearing.

Several persons ate of this fish in 1786, and experienced the symptoms above mentioned; one of them exhibited very remarkable phenomena. This man had, for two years, an ulcer in the leg, which had resisted all the curative means employed about it: at the moment he ate the fish of which we are giving the history, it was decided to amputate the limb, an operation which was considered indispensable for the preservation of the patient. A few moments after having eaten the fish, he experienced the symptoms we have described; but at the end of two days, the suppuration became more abundant, the discharge was thick, and of a better colour; the whole surface of the skin was covered with spots, which became holes, and discharged copiously a substance of a white colour, thick, and as it were curdled. This secretion did not cease till the end of six weeks; after which, the ulcer proceeded towards a cure, and the patient was entirely recovered a few weeks after, without any other means being employed.

The *Sparus Pargos* of Forster (*Porgee* of the English) produces effects similar to that of the *Coracinus;* but they are much less in the West Indies.

(*CORYPHÆNA CÆRULEO VARIE SPLENDENS, CAUDA BIFURCA; CORYPHÆNA HYPPURUS* OF LACÉPÉDE) *DOLPHIN* OF THE ENGLISH.

1005. *M. Chisholm* asserts, that this fish produced in an inhabitant of the island of Grenada, a violent head-ache,

nauseas, an eruption of broad spots, of a vermillion colour, an intolerable itching, and a tightness of the chest: these symptoms yielded to a simple treatment.

(MURÆNA MAJOR SUBOLIVACEA) CONGER EEL OF THE ENGLISH.

1006. In the month of April, 1791, several persons of the Island of Grenada ate of this fish. The following night, they experienced gripings, *cholera morbus*, a peculiar sensation in the lower extremities, which might be designated by the name of *convulsive twitches*. A child, who had also eaten of it, experienced faintings. The negroes suffered more than the whites; they all experienced a coppery taste in the mouth, and a sensation in the œsophagus, as if it had been excoriated. These symptoms, in the negroes, continued a fortnight, and terminated by a paralysis in the inferior extremities. One of these persons had a general paralysis of the whole side. In the child, a very extensive eruption broke out on the hairy scalp, which exhaled a very disagreeable smell. They were all restored to health after several months' sufferings.

(SCOMBER MAXIMUS,) KING-FISH OF THE ENGLISH.

1007. This fish, especially the variety known by the name *Bastard King-Fish*, has produced sometimes *cholera morbus*, and an eruption of a red colour.

OF MUSCLES.

1008. It is perfectly ascertained that many persons have experienced serious symptoms after eating Muscles: these symptoms have sometimes been followed by death. This truth will be placed beyond a doubt by the following facts.

Observations.

1st. *Mademoiselle* ***, aged sixteen years, of a very good constitution, and who was not at that moment at a critical period, ate five or six Muscles that had just been cooked, but had not been seasoned. She experienced immediately after, a very violent suffocation, which continued increasing: her face was swelled, the whole body covered with white patches, very large and very prominent; the patient experienced great agony, perspired a little, and had a painful shedding of tears. A few cups of sugared water were administered to her, and some time after, she was made to take, by spoonfuls, two drachms of ether in two ounces of peppermint water. The first doses of this mixture were scarcely swallowed, when the pustules subsided, and the other symptoms disappeared. A few cups of an infusion of orange leaves easily put an end to the fatigue and agitation which had been the consequence of this indisposition. A slight cold with which this young lady was affected before the accident, was found to be entirely dissipated. The father of this young person experienced no inconvenience after eating a great quantity of these Muscles.

M. de Montegre, from whom we have borrowed this observation, mentions, that a similar event had recently occurred in his own neighbourhood.*

2nd. *Dr. Charlet* reports the following fact: "Madame G., aged forty years, of a sanguineous lymphatic temperament, was enjoying perfect health. She ate some Muscles for her dinner. Two hours afterwards, being at the play, she took a few pieces of orange, and experienced immediately irregular shiverings, a pain in the epigastrium, with oppression and difficulty of breathing, general uneasiness: the face became red and swelled; the suffocation continued increasing to such a degree, that the patient was not able to lie down on

* *Gazette de Santé*, 1st Mars, 1812, p. 51.

returning to her own house. To these symptoms were united very violent itchings, and a sudden and intense discharge of mucus from the nose. *M. Charlet* prescribed sinapisms to the legs, and a warm fumigation, into which was put, at different times, three drachms of sulphuric ether, the vapours of which were directed into the mouth and nostrils by means of a funnel. In a short time the face became pale, and the other symptoms subsided. At the end of a quarter of an hour, the patient fell asleep, and complained only of a slight fatigue the two following days. (*Gazette de Santé*, du 21 Mars, 1813.)

There may be seen, moreover, in the Number for the 11th April, of the same Journal, two instances of this kind of poisoning; one of which was cured by M. Dentangeon, and the other by an apothecary.

3rd. " On the 18th of September last, Madame ***, thirty years of age, of a delicate state of health, but at that time very well, ate at her dinner, among other things, about ten Muscles, forming part of a dish of that kind of shell-fish which was prepared as sauce to a fowl. About an hour after the meal, she experienced a difficulty of breathing, slight pain of the head, frequent sneezings, expectoration, and copious secretion of mucus from the nostrils, and in appearance all the symptoms of a violent cold which had advanced with extreme rapidity. In a short time, all the symptoms increasing, the chest became loaded, and the breathing was sterterous: then the upper eye-lids only began to swell, a very severe itching was felt all over the body, and there appeared on some parts, especially on the shoulders, a vesicular eruption similar to that of the stinging of nettles. The difficulty of breathing did not cease to increase, and the tumefaction of the superior eye-lids was increasing visibly to the eye. At the end of ten minutes, the eruption disappeared, and convulsive spasms seized the breast, in such a manner as to threaten instant suffocation. It is remarkable that the impediment of the respi-

ration took place particularly in the movement of expiration which was performed in a convulsive manner, and with excruciating pains. The agony, which continued every moment increasing, was so great, an hour after the invasion of the symptoms, that the patient, ready to expire, seized violently upon every thing that surrounded her, to seek some relief. *Dr. Dulong* administered a very strong dose of ether. At the same moment, all the symptoms subsided as if by enchantment; the tumefaction of the superior palpebræ, which remained, went on increasing till evening, to such a degree as to intercept vision. The inferior lids did not swell till next day, and three or four days after, the patient exhibited no other symptom than a notable leanness."*

There were neither vomitings nor indigestion in the person who forms the subject of this observation; she was not at the period of her menstrual evacuations.

4th. *Professor Fodéré* mentions, in his work on Medical Jurisprudence, having opened the body of a man who had died two days after having eaten Muscles, and that he had experienced nausea, vomitings, and tenesmus; his pulse had been small, tight, and hurried; the stomach and intestines were slightly inflamed; there were also lesions in some of the other organs; but they were depending on antecedent diseases.†

5th. Two children, one nine years of age, the other fourteen, ate, on the 1st July, 1814, some Muscles, which were putrid. The next day, they vomited. The day after, they experienced a great difficulty of breathing, gripings, intense thirst; the abdomen and face swelled up; the skin was covered with an eruption as it were from nettles, accompanied by an intolerable itching; they continued to vomit fluid matter, of a dark green colour. The youngest of them was delirious, and sunk into a state of coma; convulsive contorsions took place all over the body, and continued till the following day, when

* *Gazette de Santé*, 1er Octobre, 1812.

† Tome iv. p. 85.

he died. On the 4th July, the eldest exhibited distressing symptoms; his face was of a pale ash colour, the pupils very much dilated, the breathing difficult; he had an unquenchable thirst, nausea, and gripings; the extremities were cold; the pulse frequent and small; there was *subsultus tendinum.* Evacuants were administered in vain: he died a few hours after. There were scarcely any alvine evacuations in these two cases.*

6th. Captain Vancouver, in his voyage to the coast of America, mentions, having seen one of his men die in a state of coma after having eaten Muscles. Two others of the ship's company, who had partaken of the same, recovered after several days, by means of a great quantity of warm water, which excited vomiting.†

1009. What is the cause of the symptoms produced by Muscles and other poisonous fish? Several different opinions have been advanced on this subject.

1st. It has been pretended, that it depended on a morbid alteration of these *Molluscæ,* and, in this case, the poison has been made to reside, sometimes in every part of the animal, sometimes in one of its organs. *M. Burrows,* in his excellent paper on poisonous fish *(just quoted)* has collected a multitude of curious facts, which attest, on the authority of *Quieros, Forster, Thomas, Chisholm, Quarrier,* &c., that certain fish when fresh, had been eaten without inconvenience, and which had no appearance of disease; but that the next day these same fish were extremely poisonous, although they had been salted. He is of opinion, in consequence, that their deleterious effects ought to be attributed to a peculiar alteration of the fluids secreted, and of the functions of these animals; an alteration which disposes them in a singular manner to a speedy putrefaction. Their poison, says he, is more

* An Account of Two Cases of Death from eating Muscles, by George Mann Burrows. London, 1815.

† VANCOUVER's Voyage of Discovery, vol. ii. p. 286.

active after the annihilation of the vital powers. He besides combats successfully the opinion of those who make the poison to reside in one part only of the animal, as the skin, stomach, intestinal canal, gall bladder, and liver.

2nd. It has been believed, that the poisonous properties of these Molluscæ and poisonous fish, depended essentially on the substances they happen to feed on. Thus they have accused in turns, the Manchineel *(Hippomane Mancinella)* narcotic marine plants, such as the *Corrallina Opuntia*, crabs, small marine stars, the spawn which these animals contain at certain periods, green copperas (sulphate of iron), the preparations of copper, those of barytes, &c. &c. *James Clarke, Chisholm* and *Beunie* have principally supported these opinions. *M. Burrows* affirms, with reason, that the first of these hypotheses are totally destitute of foundation; that there are no facts to support them; and he consequently confines himself to the examination of those which make the deleterious properties to reside in some mineral substance. 1st. The sulphate of iron, he observes, is a substance too little hurtful to be regarded as the cause of the symptoms produced by these animals. 2nd. As to the preparations of copper, how can we conceive their introduction into these Molluscæ? without doubt after their solution in water. Now, the analysis of sea-water made in different places, has never discovered one atom of this metal. Beside, would not these animals themselves be killed after the ingestion of a preparation of copper?* And how many times have we not seen fish caught in the ocean produce the same symptoms as those caught in shoal waters, near the land, where not an atom of copper could be discovered?

3rd. It has been thought also, that the action of Muscles

* It is far from being understood here, that the animals which attach themselves to the copper which covers the bottoms of ships, and which contain a quantity of vert-de-gris, are not hurtful, in consequence of the quantity of poison which is applied to their surface.

depends on a peculiar disposition of the stomach (idiosyncrasy): such is the opinion of many respectable men of science.

Our friend *Dr. Edwards,* a physician of very distinguished abilities, is in possession of a number of remarkable observations on this subject, which he has been so good as to communicate to us, and which appear to us to be deserving our attention.

1st. A person who otherwise enjoys a good state of health, and who had always experienced indigestions every time he ate gudgeons, ate of a pye in which there were balls made principally of the flesh of the gudgeon: he found them excellent without knowing what he had eaten: but, two or three hours afterwards, he experienced an uneasiness at the stomach, nausea followed by vomiting, and some other symptoms. The constancy of the hurtful effects of this food obliged him to renounce it. This peculiar aversion of the stomach without the taste having any share therein, may arise unexpectedly for a kind of food which has been constantly used before without any kind of inconvenience.

2nd *Madame S.* had always eaten trout without any kind of inconvenience; nothing had sensibly affected her health, when she was all at once struck with a strong indigestion followed by vomiting, after having eaten this fish at dinner. She could only attribute it to the existing state of the stomach, which was not able on that day to bear so wholesome a food: but since that time, the smallest quantity has constantly been sufficient to produce an indigestion, accompanied by nausea and vomiting. Not considering the affinity existing between this fish and salmon, she thought she should be able to eat that as before; but she experienced from it the same effects as from trout.

3rd. A young man, who was somewhat debilitated by a debauch, suspecting that his mother, who was a widow, had the intention of marrying again, was deeply affected by it. One day, when he was dining with the person who was privately become his father-in-law, and who was the object of

his hatred, he experienced a very strong emotion during the whole time of the dinner. He ate some muscles, which under other circumstances, had never done him any harm, but which, in the present case, occasioned him an uneasiness at the stomach; and some time after, he had a strong attack of a nervous affection, which put on the appearance of epilepsy: he stretched out his limbs, twisted his arms, his mouth was foaming, and his eyes fixed. This state continued for several hours, it was repeated eight or ten times during the space of several weeks, without, however, proceeding further, or having any unfortunate termination.

4th. Amongst the persons that have been indisposed from eating Muscles, several have been so at different times; at one time, they have taken this food with impunity; at other times, they have suffered greatly for having made use of it: which corresponds perfectly with the effects produced sometimes by other kinds of food. *M. Edwards* has known persons who were so fond of muscles, that they would not give them up although they had been frequently incommoded by them: it is only passing an unpleasant quarter of an hour, say they. There was one amongst them, who was generally considered to have had three or four diseases of this kind, and who did not expose himself any the less to it, reckoning always on the time when he might eat them without inconvenience.

5th. A lady was scarcely able to eat a single Muscle, without exhibiting the symptoms which have been qualified with the name of poisoning. Another one has an habitual disposition of the stomach, to reject absolutely sorrel and radishes, a disposition which her daughter partakes of; and Muscles do not disagree with them. Another lady is not able to eat strawberries, without experiencing a violent indigestion. The same thing happens to one of her sisters whenever she eats herrings. Lastly, another sister is not able to eat Muscles, without experiencing the symptoms of swelling, and cutaneous eruptions which frequently result from them.

" If to this day," says *M. Edwards*, " it has been impos-

sible to prove that Muscles contain a poison hurtful to all persons in general, and that, on the other hand, this kind of food produces only effects common to several kinds of fruit and fish, it is more rational to make them depend on a peculiar disposition of the stomach, a disposition which may take place all at once, continue, or cease after a certain time.

OF POISONOUS ANIMALS WHOSE FLUIDS HAVE BEEN DEPRAVED BY ANTECEDENT DISEASES.

1010. It has been long known, that horses, oxen, sheep, and even the human species, under certain circumstances contract diseases, in which the saliva, the blood, and other humours are altered, and are capable of producing, by their contact with living animals, fatal affections, followed sometimes by death: of this number are pustules, malignant ulcers, gangrene, *rabies*, &c.

MALIGNANT PUSTULE *(ANTHRAX)*.

1011. *M. M. Enaux*, and *Chaussier* have collected a very great number of facts, which prove that this disease has for its cause a septic *virus* engendered in diseased animals, and transmitted to man. They have given them in a very excellent work printed at Dijon in 1785, and which has for its title: *Methode de traiter les Morsures des Animaux enragés.*

1st. A shepherd bled one of his sheep, which had just died suddenly; he carried it home on his shoulders; but the blood penetrated his shirt, and was rubbed upon his loins. Two days after, a *Malignant Pustule* appeared upon this spot.

2nd. A person was seized with a *Malignant Pustule* on the finger, in consequence of having prepared a hare. Others have been affected by them, sometimes from introducing the hand into the rectum of a cow, which had been attacked with the *heat*

(feu), or from flaying dead wolves; lastly, from having introduced medicines into the throat of a sick ox. *Enaux and Chaussier.*

3rd. A woman applied her finger to her own cheek, after having touched the acrid serosity, which oozed from a Pustule with which her husband was affected. At the end of two hours, she had a tumor on the cheek which made a rapid progress. (*Thomassin.*)

4th. Every species of insect, in sucking the blood of an animal, which has died in a state of *anthrax*, may also transmit the virus to man.*

5th. *M. M. Enaux* and *Chaussier* make mention of a man who received a drop of pus on the lower lip, in opening an abscess in one of his oxen, and who contented himself with slightly wiping the part. The same evening, there came on a swelling, pain, and hardness; at length, a malignant *ulcer* made its appearance, with callous edges, turned back, and which was only cured by an operation.

6th. A boy employed in skinning an ox which had been killed at an inn at *Gatinais*, because it had been sick, put the knife into his mouth. Shortly after, the tongue swelled up; he experienced a tightness of the chest; the whole body was covered with pustules, and he died on the fourth day, of a general gangrene. The inn-keeper, who was pricked in the middle of the hand by a bone of the same animal, suffered great pain; gangrene seized the arm, and he expired on the seventh day. The servant girl received on her right cheek a few drops of the blood of the same ox, which produced inflammation followed by gangrene. (*Duhamel.*)

* The Malignant Pustule is not always contagious: *M. Bayle* has seen it reign epidemically in two villages, *Vernet* and *Coulonbroux* (department of the Lower Alps), and the persons who were affected did not communicate it to those with whom they slept: there had not been an epidemic amongst the cattle; no animal had died of carbuncle, nor had any suspected food been made use of. (*Dissertation inaugurale soutenue à Paris, en* 1800.)

7th. A woman introduced some medicines into the throat of an ox, and applied immediately her hand, wet with the slaver, upon the bosom of a young girl, who complained at the end of a few hours, of a burning itching of the bosom. A cold shivering took place, with a general horror, intense fever, and *phlyctænæ*, which led this young person to the grave in a very few days. (*Enaux* and *Chaussier* on the authority of *Chaignebrun.*)

8th. A man, who had his face naturally covered with pimples, opened an ox, which had died of carbuncle (*charbon*), and applied his hands stained with the blood to his face. An erysipelas of the nature of *anthrax* in a short time made its appearance, which was followed by shiverings, nausea, syncope, and death. (*Chabert.*)

9th. The punctures made with the point of a scalpel, in young men who devote their time to dissections, and who are of a weak constitution, produce sometimes grievous symptoms, such as enlargement of the axillary glands, œdematous swelling, putrid fever, and death.

1012. These observations, and a very great number more which we could relate, prove that the persons most likely to contract this disease are butchers, tanners, farmers, veterinarian practitioners, shepherds, and in general all artisans, who handle the fleeces and skins of animals that have died of any suspicious disease.

SYMPTOMS OF THE CONTAGIOUS MALIGNANT PUSTULE.

Prominent Variety. The following description is given by Enaux and Chaussier.

First period. Itching troublesome, but slight, without redness, or heat, or tension of the skin; a pricking, sharp but transitory; by degrees the cuticle becomes detached, and forms a serous vesicle, which at first does not exceed the bigness of

a millet seed, but which increases by little and little, and becomes brownish; the itching returns from time to time, the patient scratches, and breaks the vesicle, which covers the hot-bed of the evil: a drop or two of a reddish serosity escapes; the itching ceases for a few hours.

Second period. Formation of a small moveable tumor, hard, circumscribed, flattened, having commonly the bulk and form of a small lentil: the colour of the skin is not yet altered; except only in the centre and under the first vesicle, it is generally of a citron colour, livid and grained: the itchings become more sensible and more frequent; there is added to them a sensation of heat, erosion, and burning; then the texture of the skin swells up, its surface appears tense and shining; the *rete mucosum* swells, and forms round the central point a sort of areola or circle, more or less broad and prominent; sometimes pale, sometimes reddish or livid, sometimes orange or clouded with different colours, with small *Phlyctænæ*, at first isolated, but which unite in the end, and are full of a reddish serosity. The central tubercle, which forms the primitive tumor, changes colour; it becomes brownish, very hard and insensible; it is a gangrenous point, which takes all at once a fresh increase.

Third period. The evil does not confine itself to the thickness of the skin, but penetrates a little at a time into the cellular texture: the centre of the tumour becomes harder, deeper, and entirely black; the eschar extends by degrees; the vesicular areola, which always forms its border, announces and precedes the progressive steps of the mortification. This areola advances and increases by degrees; sometimes it elevates itself and forms round the primitive nucleus a kind of cushion, which gives it the appearance of being depressed, and which forms a second tumor, compact, but less hard, and still sensible. There comes on in the mean time a considerable swelling, which frequently extends to a great distance, which is neither inflammatory nor œdematous, but which partakes of

the *meteorismus* and *erysipelas;* it is a kind of swelling that is elastic and resisting, which causes a sense of strangulation and stupor in the part; gangrene at the same time is making a progress in the cellular texture. If the treatment be methodical, and the subject strong and robust, this third period lasts four or five days. At first the evil stops, the swelling loses by degrees that state of tension and emphysema which characterized the erethism and irritation; the vesicular areola puts on a more lively colour; the true inflammatory character is recognized in it; the patient feels a gentle heat in the part, and repeated pulsations; the gangrene confines itself, giving place after the falling off of the eschar, to a profuse suppuration; but in subjects that are weak, or labouring under cacochymia, the disease makes a rapid progress, and the infection becomes general.

Fourth period. After having attacked successively the *rete mucosum*, the skin, and the cellular texture, the alteration becomes general, the pulse concentrated, more or less frequent and unequal; the skin is dry, the tongue parched and brownish; the heat appears moderate; nevertheless the patient feels an internal fire which consumes him: he frequently calls for drink, and nothing assuages his thirst; he is always in a state of exhaustion: he complains of prostration, cardialgia, continual anxiety; sometimes he feels acute pains, at other times the breathing is short and interrupted; the urine is rare, thick, and lateritious; diarrhœas, colliquative sweats, and hæmorrhages are sometimes, though rarely, seen to come on. If the mischief goes on to its last term, the patient falls into a state of low delirium; all the local symptoms increase in violence; the swelling becomes enormous, and the patient dies in a state of gangrene, diffusing the most fetid smell. (Op. citat. p. 184—192.)

Depressed variety, described by *M. Davy la Chevrie.* It begins by a very violent itching, which lasts several days. On the second day, there is formed a black point, similar to the

bite of a flea. The next day *phlyctænæ* circumscribed and regular, pain, heat, and sense of numbness in the part of the limb situate below the eruption; weakness, nausea, concentrated pulse. The *phlyctænæ* break, and a reddish serosity oozes out. A portion of skin is perceived below, which is black as charcoal, and which adheres little to the subjacent parts: there is very little swelling; nevertheless it sometimes exists. On the fifth day, agony, and frequently repeated lipothymia. On the sixth, silent delirium, local tumefaction, gangrenous state very decided; at last death takes place. This variety is more dangerous than the *prominent*.*

OF THE *RABIES* (HYDROPHOBIA).

1013. The opinion most generally admitted at the present day, is, that the *Rabies* is a most terrible nervous disease, which is capable of being produced spontaneously both in men and animals; but *which can also be communicated by the bite of a rabid animal, whose saliva is very much depraved.* It is principally on this last account, that it deserves a place in this work. Of late, *M. Girard* (of Lyons) has endeavoured to prove, that the Rabies was never communicated, that the saliva was not the cause of the phenomena which characterize it, but that it depended on a local irritation. We do not conceive that this hypothesis ought to be admitted, because it is not supported by any decisive fact, consequently we shall continue to look upon this disease, as capable of being communicated by inoculation.

Spontaneous Rabies. Horses, mules, asses, oxen, hogs, and, still more frequently, foxes, wolves, cats, and dogs, become rabid without having been bitten; man is likewise in the same predicament, although rarely: lastly, it has been asserted, that cocks and ducks have been seen spontaneously af-

* *Dissertation Inaugurale de* M. Davy la Chevrie, *soutenue à Paris, le 7* Janvier, 1807, p. 12.

fected with this cruel disease, which they have communicated to other animals. Ruminating animals do not appear to be capable of contracting the Rabies, otherwise, than by inoculation. *Sauvages* speaks, in his Nosology, of a young girl who became rabid, and died at the end of three days, in consequence of being very strongly solicited by a young man at the time she had her menses. We read in *Felix Plater*, the history of a young woman who died rabid immediately after a great fright which she experienced from seeing herself left in the night by her companions, while she was occupied in washing linen under a bridge. *Doppert* relates, in the *Annales de Breslaw*, that several children had been attacked with *Rabies* without having been bitten by any rabid animal. Mention is made in the *Philosophical Transactions of London*, of a man who, going out from the gaming table in despair at having lost his all, bit himself in the wrist, and died rabid. How many more observations of this kind could we not produce, by consulting the Memoirs of *Trecourt*, *Salius Diversus*, *Lecat*, *Kœhler*, *Lavirotte*, *Laurent*, &c. given in different periodical collections?

Causes of Spontaneous Rabies. In general this disease is most frequent in sultry hot summers, and in severe winters, when the animals can no longer find any fluids to quench their thirst.* Unwholesome food, hunger, extreme fatigues in the heat of the sun, the presence of worms in the stomach, strong passions, fright, sorrow, rage, despair, and a number of antecedent diseases are regarded as exciting causes. We are far from thinking that all animals subjected to these causes become rabid; experience formally contradicts this assertion. Three dogs were shut up in one of the Wards of the Veterinary School of Alfort. One of them was fed with salted meats;

* It appears however to be more common in cold, than in hot countries. *Volney* asserts, in his travels, that it is unknown in Egypt and Syria; the same thing may be said for the Cape of Good Hope, according to *Barrow*.—*(Vide his Travels in the interior of Africa.)*

no drink was given him, and he lived forty-one days; another took nothing but water, and he died thirty-three days after; lastly, the third remained twenty-five days without eating or drinking, and he expired. None of these animals experienced any symptom of *Rabies.**

The symptoms of spontaneous *Rabies* do not differ essentially from those of which we shall have occasion to speak shortly, in giving the history of communicated *Rabies.* They make their appearance, however, as soon as the cause which produces them exists, whereas, in the other variety, they delay their appearance one or two months, and even more.

Communicated Rabies. The *Rabies* is most commonly communicated by the bite of an animal affected with it. It may nevertheless take place by the simple action of licking, or by the application of the saliva to the lips, to wounds, ulcers, or parts covered with mucous membranes. We could bring forward a very great number of observations in support of this proposition: we shall however confine ourselves to the following.

Observations.

1st. *Surlu,* aged twenty-four years, was bit on the 10th of May, 1813, on the *Boulevard de la Salpêtrière,* by a rabid dog, which, during two days, made such great ravages in Paris, that more than sixty persons were bit by him: fifteen of them at least were cauterized at the Hotel-Dieu with the iron heated to whiteness. Three of them were still there, waiting for the cicatrization of their wounds, at the moment Surlu was brought in. The unfortunate man in question had received three small wounds on the right heel, which *M. Murat,* who is the assistant surgeon of the Salpêtrière, cauterized with butter of antimony an hour after the accident. Surlu, feeling secure by this operation from the dangers which he would

* *Dissertation sur la Rage,* par M. Bleynier, *soutenue à Paris, le* 28 Mars, 1815.

have incurred without it, gave himself up without any uneasiness to his ordinary occupations, and even to all the excesses of debauch during a month, the time in which the cicatrization of his wounds became completed. All at once this young man lost his natural gaiety; all his motions became sudden, rapid; he sat down, rose again precipitately, and without any motive; he wept sometimes, and testified to his parents the fear he had of becoming mad. The next day, he felt a repugnance to drinks, and if any were raised to his mouth, they were suddenly rejected. On the third day from the attack, all the symptoms of the hydrophobia declared themselves; it was now not without trembling that his parents sought to tranquillize him; they took advantage of a moment of tranquillity to put him into a coach, and bring him to an hospital. This patient, on leaving his father's house, had the misfortune to hear it declared, that his death was inevitable: this idea struck him with horror, and he gave himself up a prey to all the fury of the disease. He arrived at the Hotel-Dieu, the 8th of June, 1813, at the end of the third day from the attack. The agitation of this unfortunate man, which was however quieted by some questions calculated to interest him, the vivacity of his looks, united to the disquietude which reigned throughout his whole frame, the foam which issued from his mouth, and which he was spitting incessantly, the sensation of constriction, the pain of the fauces, and the horror which he felt towards all fluids, were the symptoms by which the *Rabies* was recognised.

M. Professor Dupuytren, being convinced of the impossibility of arresting the progress of this disease by the bite of the viper, by the preparations of metallic oxyde, by bleeding, baths, &c. convinced equally of the inefficacy of opium in glysters, even were it given in a frightful dose, not being able to administer it by the mouth, on account of the horror of fluids, resolved to introduce it immediately into the venous system. Consequently, he made a solution of the gummy

extract of opium in distilled water, charged the syringe of *Anel* with it, and after the usual precautions, injected into the saphæna vein about two grains of the mucous extract of opium. The patient, a moment after, appeared more quiet; which suggested to *M. Dupuytren* the idea of doubling the dose of the injection about eight in the evening; he then made choice of the cephalic vein, and introduced into the circulation four grains of opium. The patient remained for three hours in the most perfect tranquillity; but at that period he agitated himself, and frequently changed his position; he rose up, kneeled down on his bed, explored the surrounding space with astonishing rapidity; at one time, he uttered horrible cries; at another, he groaned about the cruel malady to which he was the victim: he incessantly regretted not being able to bid his last farewell to his family, especially to his father. It was then no longer possible to occupy his imagination; he passed the rest of the night in a state of extreme agitation. The next day, (the fourth from the invasion of the symptoms,) *M. Dupuytren* went to visit him at five in the morning, and found him in such a state of dejection, that he thought he would not exist two hours longer. The sister herself, believing him to be dead, had covered him with his sheet. Nevertheless, towards eight o'clock, the patient came to himself, and talked of nothing but his father. In a short time, he agitated himself, was continually spitting, recommended the windows to be shut, and that they should not direct the current of air upon him, nor shake his bed-curtains. His imagination was managed dexterously, by proposing questions which interested him; he answered extremely well to them, and sometimes even with cheerfulness. He permitted the injections to be renewed, under condition that they would send for his father. They promised to do whatever he desired, and an ounce of distilled water, holding in solution from six to eight grains of opium, were introduced into the circulation. The patient was left to himself. Half an hour after, *M. Dupuytren* returned to see

him, and found him in the same situation in which he had left him the evening before, and during the same day; the mouth half open, and filled with a frothy saliva; the eyes fixed; the head slightly bent backwards, without any tetanic movement; the breathing short, the pulse scarcely perceptible; in fine, he expired a few moments after.

On the 19th of June, during the time which elapsed between the last injection, and the death of this patient, *M. M. Magendie* and *Breschet* took some of the saliva, transported it twenty paces from the bed of the patient, by means of a piece of linen, and inoculated with it two dogs in good health. One of them became rabid the 27th of July, and bit two others, one of which was at the height of the disease on the 26th of August.*

2nd. *Cœlius Aurelianus* asserts, that a sempstress became mad in consequence of having mended a garment that had been torn by a rabid animal. She had passed the thread into her mouth, and pressed the seams with her teeth.

3rd. *Palmarius* relates, that a peasant in a state of *Rabies*

* *Dissertation sur la Rage*, par *M. Charles Busnot, soutenue à la Faculté de Médecine de Paris, le 12th Fevrier*, 1814.

M. Girard, who does not admit the existence of communicated *Rabies*, has made the following objections: 1st. Supposing, that the dog that bit Surlu was mad, the venom ought to have been destroyed by the cauterization of the three small wounds made in the heel. 2nd. The symptoms developed by the rabious venom are first felt in the part bitten; now, Surlu did not appear to have experienced any remarkable symptom in that part, since no mention is made of it in the observation. 3rd. The symptoms to which this person was a victim, cannot be of any use to prove that he was rabid, for they are common to many nervous affections, both internal and external. 4th. How can it be proved, that the dogs which *M. M. Magendie* and *Breschet* inoculated with the saliva of Surlu were rabid, since every thing relating to these dogs is not made known from the moment of their biting to the end of these experiments, and no information is given relative to the appearances on dissection?

It is easy to perceive how far these objections are from proving that the *Rabies* had not been communicated to the person who forms the subject of this observation, and to the animals inoculated by his saliva.

called together his children, kissed them, and communicated to them the *Rabies*, of which they died on the seventh day. The same author assures us, that he has seen oxen, horses, and sheep, contract the *Rabies*, in consequence of having eaten some of the litter on which rabid pigs had died.

4th. *M. M. Enaux* and *Chaussier* have seen a man attacked with this disease from having received the saliva of a mad dog on the lip.

Symptoms of Communicated Rabies. *M. M. Enaux* and *Chaussier* have described with the greatest care the symptoms of this horrible disease, which several other authors have since copied without pointing out the source: "As the wound is the hot-bed of the poison, so it is always by it that the symptoms begin. If it be closed, the cicatrix becomes red, bluish; it extends, sometimes opens afresh, and a reddish serosity oozes out; the sleep is disturbed, agitated, troubled by starts and frightful dreams: the patient is overwhelmed with solicitude, heavy, plunged into a profound melancholy, without knowing the cause of it, from which nothing can distract him; from time to time, he experiences a heat, a horror which extends from the wound, mounts upwards, gains possession of the whole body, and seems to terminate in the breast and throat; frequently the pulse is small, hard, and tight. This state is the first degree of the disease, and lasts four or five days. In the second, all the symptoms increase, the pulse becomes frequent, and indicates an irregular and nervous fever, which destroys the principle of life; the patient experiences a painful tightness of the chest and throat; the breathing becomes difficult, interrupted by involuntary sobs, and deep sighs; from time to time convulsions are perceived, which are kept up, or renewed by the slightest cause; in a short time, reason wanders, the patient becomes furious, does not know those about him, and endeavours to bite them;* every thing teases

* This sign is far from being universally present in Rabid men; we have

and irritates him. Bright colours, a strong light, acute sounds, sometimes even the simple agitation of the air renews his paroxysms of madness; consumed by an internal heat, tormented by a considerable thirst, he still dares not drink; the sight of water, the idea of it even, makes him shudder; the eye is haggard, fixed, sparkling, and appears inflamed; the voice is hoarse, the mouth filled with a frothy and glutinous saliva; every thing announces madness, and characterizes the hydrophobia. At one time, preserving his judgment, mild, and peaceable, plunged into a profound melancholy, he is conscious of his misfortune, foresees attacks, and gives notice of them to his friends; but almost always the sight of water causes him a secret horror, which reason is not able to overcome. (A circumstance which has caused the name of *hydrophobia*, that is to say, *horror of water*, to be given to this disease.) Agonies and vomitings aggravate these evils; the pulse becomes unequal, intermitting; a cold sweat covers the whole body, and death puts an end to this scene of horror. This state lasts at most three or four days." (*Methode de traiter les Morsures des Animaux Venemeux*, p. 28.)

This disease generally takes place before the ninth day in oxen and dogs, sometimes later: in the human subject, the invasion does not take place till after thirty or forty days, although there are instances of a more speedy attack; and others in which the symptoms have not appeared till after several months.

LESIONS OF TEXTURE OBSERVED AFTER THE DEATH OF RABID ANIMALS.

1014. We are astonished on reading the authors who have written on this disease, at the varieties which the bodies of

witnessed eight cases, in which it did not appear. *M. Dupuytren* is of opinion, that it is in the nature and essence of the dog, and not that of a man, to bite.

animals that have died of it, have exhibited. Sometimes they have not discovered any sensible lesion; we have seen four instances of this kind; and *Professor Dupuytren* gives an account in his lectures, of ten dissections, the results of which were similar. Sometimes the mucous membrane of one or more parts of the digestive canal is found in a state of inflammation, and even gangrene.

M. M. Dupuytren, Magendie, and *Breschet,* who have made experiments on mad dogs, have often observed after their death, an inflammation of the internal coat of the stomach. Sometimes a sufficiently great quantity of worms have been met with, to induce some authors to suppose that they were the cause of the *Rabies,* and consequently that this was not a disease *sui generis.* In other instances, the membranes of the brain and of the spinal marrow have been found inflamed, the brain dried up, with or without effusion. The lungs have also been found adhering to their membranes, distended with black thick blood, or parched and dried up; the heart pale, and emptied of blood.

This short exposition is sufficient to shew how much uncertainty this part of the science presents.

TREATMENT OF POISONING BY VENOMOUS ANIMALS.

Serpents. The number of medicines which have been believed to be entitled to the name of specifics against the bite of venomous Serpents, has been greatly exaggerated. Amongst those which have been proposed as such, there are some that deserve our attention, whether on account of their appearing to act an important part in the treatment in question, or of their having been extolled by men of distinguished merit. What more wonderful, for instance, than the success which the negroes have for a long time obtained from the *Guaco,* a plant which grows in several parts of America, and which the

Indians make use of to defend themselves against the bite of the numerous venomous Serpents which infest their country, to such a degree as to render it uninhabitable. The following are a few peculiarities on this subject, which will not be read without interest.

1st. *Of the Guaco.* *M. M. de Humbold* and *Bonpland* have been the first to give a good description of this plant, (*Plantes équinoxiales*, tom. ii. p. 84, tab. 105.) under the name of *Mikiana Guaco.*

The *Guaco* grows naturally in the remarkably round plains of the valley of the *Rio de la Magdalena*, of the *Rio Cauca*, of the *Choco*, of *Barbacoas* (kingdom of New Grenada). These travellers, however, have seen it also in the temperate region of *Tuffagafuga*, at 940 toises of elevation, where the centigrade thermometer ranges from 17 to 22°. Between the tropics, the *Guaco* may be cultivated on heights of 1400 toises, where the temperature in the night sinks to five centigrade degrees. The *Mikania Guaco* has been frequently confounded, in late publications, with the *Ayapana* of Brazil. (*Eupatorium Ayapana* of Ventenat, *Jardin de la Malmaison*, p. 3.)

Don Pedro Fermin de Vargas, magistrate of the village of *Zipaquira*, undertook a journey to *Mariquita*, in the year 1788, in order to assure himself of the surprising effects of the *Guaco* against the bite of the Serpents of America. The report which he made on this subject was printed in one of our journals, the principal results of which we shall extract.*

The 29th of May in the evening, a negro was directed to procure a venomous Serpent, called in the country *Taya-equiz.* The next day, Vargas, being persuaded by the assurance with which the negro recounted the effects of the *Guaco* for hindering venomous Serpents from biting, desired to submit himself to the experiment. He took one or two spoonfuls of the juice of this plant: six incisions were made upon him; one on

* *Semanario de Agricultura y Artes dirigido a los parrocos*, tom. iv. p. 397. Madrid, 1798.

each foot between the toes, another between the fore-finger and thumb of each hand; lastly, two on the lateral parts of the breast. He caused a little of this juice to be inoculated into the wounds, as is done with the vaccine virus: as the blood flowed from these incisions, they let fall a few drops of the same juice upon them, and rubbed the wounds with the leaf of the *Guaco*. He then took into his hands, and at three different times, the venomous serpent, which seemed a little uneasy, but did not shew the least appearance of having any inclination to bite. Several persons who had been witnesses of this fact, wished also to submit themselves to the experiment; and the results were the same, except in the case of *Don Francisco Matiz*, who was bitten on the right hand, because the reptile was much irritated in consequence of some forced movements which he was obliged to perform. The spectators were all in great consternation, when the negro wiped away the blood which flowed from the wound, and rubbed the bitten part with the leaves of the *Guaco*, and affirmed that no harm would result from it. In fact, *Matiz* breakfasted as well as usual, and was able to attend to his business.

The negroes are in the habit, after the inoculation we have described, to continue the use of this plant every month during three or four days, in order to run no risk in taking the venomous reptiles. *Vargas* is of opinion that this practice is needless, and that it is sufficient to rub the hands with the leaves of this plant a little before laying hold of the animals; for he is of opinion, that the disagreeable smell which it exhales, is sufficient to torment these reptiles, and put them to sleep. We owe to the friendship with which *M. Humbold* has honoured us, several particulars on this subject. " I have observed," says this celebrated naturalist, " that on tying a very venomous serpent (*Coluber Corallinus* of Lin.) upon a table, and bringing a pole near him, he does not turn away his head until the extremity of the pole has been dipped in the

juice of the *Guaco*. This experiment induced me to believe that the inoculation of the Guaco imparts an odour to the skin; and that the serpent is afraid to bite, on account of this peculiar modification of the cutaneous perspiration. I doubt whether it is sufficient, to prevent being bitten, to carry about with one the leaves of the *Guaco*. The natives assured us, that it was necessary to be inoculated. When the bite has taken place, they place the leaves of the *Guaco* chewed and mixed with the saliva upon the wound, and at the same time take the juice of the plant internally. At *Tuffagafuga*, a horse that had the whole foot swelled up from the bite of a serpent, refused at first to eat the *Guaco*, which has a bitter taste and a disagreeable smell; in a short time, however, as if the animal had the knowledge that it would cure him, he fed on it with an appetite. The swelling of the leg very soon subsided."

It would be a desirable thing, that the Spanish Government should appoint a committee, composed of some enlightened members, who might employ themselves in multiplying and varying the experiments proper for fixing our ideas on one of the most extraordinary results that have ever been obtained.

2nd. The *Arsenite of Potash*, and the *Arsenious Acid*, have also been employed with the greatest success against the bite of venomous serpents. We read in the second volume of the *Medico-Chirurgical Transactions of London*, several observations in support of this fact.

A. *Jacob Course*, a private in the York regiment, was bit on the left hand by a serpent which was supposed to be the *Coluber Carinatus* of Lin. The middle finger was so lacerated, that it appeared necessary to amputate it immediately at its articulation with the metacarpal bone. Ten minutes after the wound, this man was in a state of stupor and insensibility. His hand, arm, and breast of the wounded side were very much swelled, of a black purple colour, and livid; he vomited, and appeared to have taken a strong dose of poison; the pulse was lively and hard: he scarcely perceived the

operation. The wound having been dressed, and the patient put to bed, a purgative glyster was ordered him, and the following draught:

℞. Liquor Arsenical. ʒ ii. *
Tinct. Opii gtt. x.
Aquæ. Menth. Pip. ℥ iss M.

To this draught was added half an ounce of lemon juice, and he was made to swallow it during the slight effervescence which this mixture produced. The stomach did not reject it; and it was repeated every half-hour for four successive hours. The suffering parts, however, were fomented and rubbed with the following liniment:

℞. Ol. Terebinth.
Aquæ. Ammon. pur. āā ℥ ss.
Ol. Olivar. ℥ iss. M.

The purging glyster was twice repeated before the patient experienced its effects. The arsenical draught was then discontinued. He had already recovered his feeling, and by little at a time resumed all his faculties. He then took some food, and slept for several hours. The next day he was extremely weak, and very much fatigued. The fomentations and liniment were continued, the swelling disappeared by degrees, and the skin recovered its natural colour. It was only necessary, in order for his perfect restoration, to keep the bowels open for a few days, and to apply suitable dressings to the wound.

B. *Dover*, a negro soldier of the 3rd West India regiment, was bit on the left hand by the same serpent. A few minutes after, vomitings, torpor, and insensibility took place; but there was less swelling and alteration of the colour than in the preceding case; neither was the wound so extensive. The edges, which were lacerated, were removed; the wound was dressed,

* This liquor is Arsenite of Potash: two drachms contain one grain of Arsenic, and as much Potash; the rest is water.

and the arsenical draught given him. The fomentations and liniment were likewise employed: a purgative glyster was administered every hour; the patient took the draught every half hour for four hours, and its use was suspended as soon as he began to be purged. He had then four hours sleep. The next day he appeared less weak, and found himself shortly after in a state to return to duty.

C. *Thomas Rally,* private of the 68th regiment, was bit on the lower part of the left leg, and brought to the hospital in the same state as *Jacob Course.* The lacerated edges of the wound were cut off, dressings applied, and the arsenical draught administered, cathartic glysters were likewise employed, with fomentations and the liniment. When he had taken the draught every half hour for three hours, there came on a violent vomiting, to that degree that the stomach was able to retain nothing; however at the end of four hours, by the use of glysters, he began to be purged; and after two hours more, the vomiting ceased; he took then the following draught:

℞. Tinct. Opii. gtt. xx.
Æther. Sulphur. gtt. xv.
Aquæ. Menth. Pip. ℥ iss. M.

He was quiet for several hours. The next day, he was extremely weak, and experienced great difficulty in making water. It was consequently necessary to resort to the catheter several times during the two first days. Emollient fomentations were applied to the region of the bladder. On the third day, all the alarming symptoms began to diminish, and from that time he quickly recovered.

D. *Patrick Murphy,* private of the 68th regiment, was bit on the wrist by the same serpent. A few minutes after, the hand and arm of that side began to swell, and were already discoloured. He did not yet vomit. The wound was dressed, after having cut off the lacerated edges, and he was made to take the arsenical draught. Cathartic glysters were

also prescribed, with fomentations and the liniment. He took the draught every half hour, for three hours; and then, finding himself very well, he ceased to take it. The symptoms were not so severe in this, as in the preceding cases. The fomentations and liniment only were continued, and in two days he returned to duty.

E. An officer and several men of one regiment, died in consequence of having been bitten by the same animal. None of them had taken the arsenical draught.

These observations were collected at Saint Lucia, by M. J. P. Ireland, Surgeon to the 4th Batt. of the 60th regiment of foot.

F. A soldier of the 63rd regiment was bit by a small serpent of Martinique. The treatment we have described was employed, and the patient was quite well a few days after.

Russel, in his work on the snakes of India, relates experiments which were made with the arsenious acid, with the design of combating the symptoms produced by the bite of venomous serpents. We think it a duty to describe the principal results of that undertaking, although they are not sufficient to fix our ideas on that head.

Experiment 1st. A small dog was made to swallow one pill of *Tanjore;** immediately after, he was made to be bit in the thigh by a *Cobra de Capello*, and the half of another pill dissolved was applied to the wound. The animal slavered greatly during the following ten minutes. At the end of an hour, he began to complain, laid down, and had slight convulsions. A second pill was administered to him, which also increased the flow of saliva. Four hours after, he was perfectly recovered.

Experiment 2nd. A young dog was caused to be bit by a

* An Indian preparation, very much in vogue for the cure of the bite of venomous animals. *Russel* does not give its composition; but he says, that the *white oxyde of arsenic* (arsenious acid) forms the base of it, and that a pill of six grains contains something less than three quarters of a grain of it.

Katuka Rekula Poda, which had already bitten and killed a rabbit. A few moments after, half a pill of *Tanjore* was given him, and the dog soon recovered.

Experiment 3rd. Another dog was bit on both thighs by a *Cobra de Capello*. Two minutes after, he was made to swallow a pill and half of *Tanjore,* which produced good effects: the animal recovered.

Experiment 4th. Half of one of these pills was given to a fowl; ten minutes after, the same *Cobra de Capello* was made to bite it, as had served for the preceding experiment; the animal soon died. Another fowl experienced the same fate; nevertheless the ingestion of the pill appeared to retard the moment of death.

Experiment 5th. A rabbit was bit by a *Katuka Rekula Poda;* a pill of Tanjore was administered to him in twice, which did not prevent the symptoms from taking place, and terminating in death.

Experiment 6th. A bitch was bit in both thighs by another individual of the same species: she was made to swallow a pill, but died as if she had taken nothing.

Experiment 7th. Two other dogs were bit in the thigh by a *Katuka Rekula Poda.* One of them took a pill five minutes after; the other swallowed one at the end of six: the symptoms took place, and the animals died.

3rd. *Ammonia* and *Eau de luce.* These fluids have for a long time been regarded as specifics against the bite of venomous serpents. *Bernard de Jussieu,* in 1747, cured by this means, a young man, who had been bitten by a viper in three places, viz. in the thumb and fore-finger of the right hand, and the thumb of the left. A number of authors have reported similar facts. *Sonnini* says,

" A young Indian had been bitten for several hours on the great toe by a serpent *(Serpens Echinatus);* his foot, leg, and thigh were prodigiously swelled and hard; he had a most violent burning fever, with delirium. The Indians had em-

ployed all the remedies they were acquainted with: they had crushed the head of the serpent, and applied it to the wound previously scarified; the patient had swallowed its liver, which passes amongst them for an excellent specific against the poison of all venomous animals; they had employed in vain several other remedies, and the patient was expiring. *Sonnini* made him swallow a tea-spoonful of *eau de luce* in a little wine; he scarified again the wound, in order to make it bleed, and applied to it a compress wetted with the same fluid. Two hours afterwards, the swelling and tension had sensibly diminished, as well as the fever. He was made to take a second dose, and the compress was renewed; it was now nine in the evening. He was left quiet during the night, and the next morning he was found walking about in the room, with the assistance of a stick; he had slept, and the fever had quitted him; there remained only a little swelling of the leg, which insensibly disappeared, and on the third day he went to his occupation of fishing.*

Nevertheless *Fontana* pretends, on the authority of a very great number of experiments, that these preparations, whether employed internally or externally, are rather injurious than useful. *M. Everard Home* also combats the opinion of those who maintain, that ammonia and *eau de luce* are specifics against the bite of serpents (*Vide* page 410). We are of the same opinion as this celebrated surgeon; but we still think that the prudent administration of the volatile alkali cannot be injurious, and even that it may become extremely useful by promoting perspiration.

Caustics. No one is ignorant of the advantages of the speedy application of caustic to the part bitten by a venomous serpent. *Fontana* has concluded from his experiments, that the *caustic potash* was the specific against the bite of the viper; an assertion which cannot maintain its ground, if we reflect on

* *Journal de Physique*, ann. 1776. tom. viii. p. 474; Observations by *Sonnini* on the serpents of Guyana.

the manner in which this alkali acts. In fact, its action is similar to that of all the other caustics. *Russel* has made several experiments on their use against the bite of the serpents of India, which tend to induce a belief that this method is not constantly followed by success, especially when it is employed fifteen or twenty minutes after the bite.

Experiment 1st. A dog was bit by a *Katuka Rekula Poda;* a few moments after, the symptoms made their appearance. He was cauterized at the end of a quarter of an hour with a hot iron, which did not retard the moment of death. Another dog, bitten by a serpent of the same species, was two minutes after under the influence of the poison. He was cauterized at the end of fifteen minutes, with sulphuric acid, and he died. The experiment repeated on another dog, who was not cauterized till eighteen minutes after the bite, presented the same results. Lastly, two others of these animals experienced the same fate.

Experiment 2nd. A bitch was bit by a *Cobra de Capello,* which had just killed a dog that he had bitten. The bitch was paralyzed instantly. The wound was cauterized with a hot iron three minutes after the bite, and she recovered. A dog was cauterized with sulphuric acid fifteen minutes after having been bitten by a *Katuka Rekula Poda:* he recovered his health. The same thing happened to another; but the serpent that bit him, had killed an animal a few moments before. Lastly, two dogs, bit by a *Katuka Rekula Poda,* were cauterized with the sulphuric acid fourteen minutes after, and recovered completely.

Russel says, in recapitulating his experiments: " the caustics have often proved ineffectual, although employed four, eight, twelve, or fifteen minutes after the bite. They have been constantly useless when applied later. As for the animals that have been saved, further experiments must be made before any thing positive can be established respecting them."

4th. *Hunault* and *Geoffroi* have demonstrated, that the oil

of olives is not a specific against the bite of the viper, as it had been asserted in the *Philosophical Transactions of London* (No. 443). They however acknowledge the utility of fomentations with this greasy substance.

5th. According to *Fontana*'s report, acids, cantharides, theriaca, the viper's fat, leeches, suction, so much employed by the *Psylles* and the *Marses*, do not in any manner hinder the dangerous effects of the viper. Scarifications, according to the same author, are rather hurtful than useful. Baths with warm water diminish the dangers, which cease altogether after a speedy amputation of the part bitten.* Lastly, ligatures sometimes prove a security from accidents.

1015. After having examined succinctly each of the means proposed up to the present day, as specifics against the bites of venomous reptiles, we shall proceed to lay down the steps which the practitioner ought to take in cases of this description. These steps without doubt will be modified, when the effects of the *Guaco* and arsenious acid shall have been appreciated at their just value.

A ligature should be instantly applied above the part bitten; this ligature should neither be too tight, nor applied for too long a time, for it would increase the lividity of the part, and expose it to gangrene. If it can be done, the bitten part should be soaked in warm water for some time. The wound should be cauterized with a red hot iron, lunar caustic, or a small piece of thin wood, the extremity of which has been soaked in butter of antimony, and multiplied scarifications should be avoided, as they frequently aggravate the symptoms. Compresses moistened with a mixture of one part of ammonia, and two of oil, should be applied to the swelled parts. When the swelling shall have become too considerable, and the ligature prove painful to the patient, it must be removed, for

* The experiments made by *Russel* with the serpents of India, are far from confirming that assertion of *Fontana*, viz. that the symptoms cease by the amputation of the part bitten.

the only intention of its application was to retard the circulation of the blood by impeding it in that part, and that end has been obtained. The internal treatment must next be attended to, which consists in general in favouring perspiration and sleep. To this end, the patient should be made to take, every two hours, a glass of the infusion of orange or elder flowers, containing two, six, eight, ten, or twelve drops of fluid ammonia, and even more, if the patient be robust. Exciting and antispasmodic drinks, such as Madeira, old wines, and ether draughts, have frequently been useful. Care should be taken to keep the patient well covered in bed; and, while he is sweating, care must be taken to avoid cooling him, on applying the dressings, or in giving him drink.

Should spasms, jaundice, or bilious vomitings come on, it will be necessary to administer ipecacuanha, or the antimoniate tartrate of potash. In fine, in those cases where the gangrene advances with rapidity, it will be necessary to have recourse to powerful antiseptics. It is needless to observe that the use of solid food should not be permitted during the early stages of the disease. When the patient begins to be tormented by hunger, weak soups should be allowed him, in small quantity, and but seldom at first; but when he begins to recover his strength, more frequently.

Scorpion. The remedies to be employed against the sting of the scorpion, are volatile alkali internally and externally, and the plants of the family of the *cruciferæ*, softening, emollient, and oily topical applications, which diminish the inflammation.

Spiders. In these cases, the wounded part should be washed with brine; theriaca should also be applied to it, and one or two doses should be prescribed internally.

Tarantula. To combat the effects of the Tarantula, such local means should be employed as serve to allay inflammation and tumefaction. It is well known how much the soft accents of music, and the measured movements of the dance, have

been extolled for the cure of *Tarentism.* Have not even airs been composed, to which the name of *Tarentolati* has been given, and sung to persons stung by this insect? We are far from refusing to music a great influence on the vital functions, and on the restoration to health of a certain number of persons who may be sick; but we are of opinion, that, in the case before us, it cannot be of any real utility except to those who may be fallen into a profound melancholy. We are far however, from blaming the use of this remedy, as no serious injury can result from it. *Amoreux* says, "music and dancing are very capable of imparting to the patient an emotion and agreeable sensation according to circumstances: he must be made to hear such sounds as sooth, agitate, charm him; and as every thing degenerates into abuse, an agreeable treatment has been converted into an exhibition. Picture to yourself, men and women with their brain affected, who, in concert with mountebanks and musicians paid for the purpose, exhibit a weeping farce, worthy of the spectators and of the performers. Such is the pretended *Tarentism:* it consists of sighs, tears, bursts of laughter, contorsions, gesticulations, which degenerate into ridicule." (*Op. citat.* p. 220.)*

* There are some persons who are so sensible to music, that it is impossible its employment should not be attended with great success in certain nervous diseases with which they are sometimes attacked. A number of authors have treated of the advantages which might be derived to medicine from this source; it has nevertheless, lain nearly in oblivion. We are fully persuaded that it might be rendered extremely efficacious under certain circumstances. Having from four years old felt a passion for this enchanting art, we have always cultivated it at every moment of leisure. Scarcely had we attained fifteen years, when it was impossible for us to hear the *chef-d'œuvres* of *Mozart* and *Cimarosa,* without experiencing great emotion, which was different according to the character of the music we were listening to. The nervous, hardy, and brilliant compositions of *Mozart,* excited in us a remarkable gaiety and courage, which continued during a great part of the night, and was accompanied with a trembling of the lower limbs. The melodious and affecting accents of *Cimarosa* plunged us into a melancholy, and we took a pleasure in shedding tears. When arrived at

Bee and Humble Bee. Should a medical man be called to a case of this kind, he ought to have recourse to the proceeding of *Swammerdam*, which consists in drawing out the sting, which is deeply buried in the flesh, taking care not to press hard on the wound, because the venom of the vesicle would be expressed, and would penetrate further with the sting. It must not be concealed, that this extraction is attended with difficulty, on account of the lateral filaments with which the sting is armed. It will be necessary then to cut off with scissars all that is outside the wound; and afterwards, to extract the sting with a small needle. The part punctured ought then to be washed with cold water, or, what is better still, as it was first discovered by *Dioscorides*, with salt and water, or sea-water. It would likewise be extremely serviceable to apply to the part in pain, some of the milky juice of the white poppy, or any other anodyne. *M. Delaistre* relates, in the *Journal de Médecine*, that he made use of this juice to appease a severe pain occasioned by the sting of a Bee; he was in a short time eased, and no swelling supervened (tom. iv. p. 309). Oily embrocations, Goulard water, and lotions of urine, may also become useful: but very little faith ought to be given to that incoherent assemblage of plants too frequently employed by empirics and country people.

the age of twenty, we were seized with a nervous affection, the evident result of this great degree of susceptibility; continual palpitations so strong, that the contractions of the heart could be felt a little above the navel: the pulse unequal, irregular, intermittent; a considerable difficulty in breathing, flying pains in the lower extremities, especially along the course of the posterior nerves; such were the symptoms to which we were a prey during six months, and which ceased only when we perceived at length the necessity of ceasing to listen to music. At this moment, when seven years have elapsed since the disappearance of these nervous symptoms, we are able to hear and to execute it with impunity; but it still does not fail to produce a remarkable effect upon us; for it quiets in a very short space of time, and, as it were by enchantment, a general cephalalgia, which is tolerably severe, to which we are subject about eight or ten times in the year.

Wasp and Hornet. The treatment to be employed for the sting of these insects, is the same as we have described above.

Poisonous Fish and Muscles. The practitioner called in to a case of this kind should administer an emetic, a purge, or emeto-cathartic, according to the time that has elapsed since the ingestion of the deleterious substance; by this means, he will produce the expulsion of it, without which, the symptoms will become more intense, and may possibly terminate in death. The patient should next be made to take small pieces of sugar containing ten, fifteen, twenty, or five and twenty drops of sulphuric ether, a few spoonfuls of an antispasmodic mixture, and vinegar and water should be given for common drink. In case symptoms of inflammation of the abdomen should make their appearance, it will be necessary to combat them by antiphlogistic means. Such are the precepts arising from the observations hitherto made: it is to be hoped that learned travellers who pass through countries where the occasions of seeing poisonings of this kind are frequent, will endeavour to determine what is the intimate nature of the poison of these animals, and the means capable of destroying or opposing their effects.

Malignant Pustule. We have distinguished, in the description of the Malignant Pustule, four periods, which really exist when the disease is left to itself: but, with the assistance of a methodic treatment, the symptoms may be prevented, or arrested in case they have already displayed themselves. This treatment consists in producing an inflammation of a good character, which keeps the gangrene within bounds, and facilitates the separation of the slough; which end may be obtained by means of incisions and caustics. The incisions, say *M. M. Enaux* and *Chaussier*, open the way to the caustic remedies, and these concentrate within the eschar the septic poison, at the same time that they excite, and produce inflammation and suppuration. Extirpation made in the living parts

is a cruel and dangerous method; the same may be said of deep incisions. Caustics, so efficacious in the first periods, are but little applicable in the latter, when the Malignant Pustule is accompanied with putrefaction: it is necessary then to insist on the use of such topical applications as are capable of restoring animation to the fleshy parts, of remedying the putrid dissolution, and of giving more consistence to the eschar. The bark combined with camphor fulfils these indications. Internal remedies are never indifferent; in the fourth period of the disease they are absolutely necessary; they ought to be chosen from the class of tonics and antiseptics. Relaxing topical means, as well as bleeding, purgative, and all other medicines which tend to weaken the organic action, are always hurtful; they dispose the parts to gangrene, render suppuration more laborious, and the cure more difficult.

Rabid Animals. The first question which presents itself, is to know whether we can cure the animal labouring under the *Rabies* either spontaneous or communicated, when perfectly developed. Several authors answer in the affirmative, and report observations in support of their assertion.

M. Nilloughby speaks of a child that became rabid forty-eight hours after having been bitten by a dog. He was bled, an excessive dose of calomel *(sub-chloruret of mercury)*, was given him, and he was cured.*

A young man labouring under a violent inflammation of the stomach, was affected with convulsions and symptoms of hydrophobia: he was cured by copious bleedings.†

M. Schoolbred, surgeon to the Indian Hospital at Calcutta, mentions having cured, by copious bleedings, a servant, twenty-five years of age, who exhibited all the distinguishing characters of hydrophobia, seventeen days after having been bitten by a mad dog. He was led to this practice from having read

* *Journal Général de Médecine,* Janvier, 1810.

† *Collection d'Edimbourg.* Baldenger, tom. 1er, p. 236.

an observation of M. Tymon, in which he speaks of a person in the same situation, who was also cured by bleeding.*

Mead, Boerhaave, Rutherford, and some other practitioners, have likewise thought that bleeding might be extremely useful in this disease.

We read in the *Bibliothèque de Chirurgie du Nord,* that *M. Grisly,* by bleeding and attenuating medicines had cured a lady, who had been bitten by a mad dog eighteen days before, and who had experienced no paroxysm of hydrophobia until that day.†

The experiments recently made in Paris by *M. M. Dupuytren, Magendie,* and *Breschet,* on mad dogs, are far from confirming the results obtained by the authors of the preceding observations; they employed bleeding *ad deliquium,* and obtained no success. Nevertheless, we are of opinion, that it would be imprudent to reject it without having reiterated the experiments, and especially without having made use of it in all the different stages of the disease.

Many observers have extolled opium, administered under various forms, for combating the symptoms of hydrophobia, and they pretend to have employed it with success. We have seen it given here by *M. Dupuytren* without the least advantage, whether administered in glyster, or injected into the veins. The experiments made on mad dogs by the authors already quoted, confirm these results: they were never able to obtain a cure; they have only observed, that animals affected with this disease require, in order to be under the influence of this medicine, a dose much stronger than sound animals.

M. Alibert relates, in his *Eléméns de Thérapeutique,* the observation of a person who had been bitten in the middle finger by a dog; he became mad. *M. Rossi* cured him by

* *Memoire lu à l'Institut de France, le* 6 Septembre, 1813, *ou Journal de Médecine,* par Sedillot, Decembre, 1814.

† Tome i. p. 44.

means of the electric fluid disengaged from the pile of Volta (Galvanism).

M. Dupuytren has lately made use of the distilled water of the *Prunus Lauro-Cerasus,* which he has injected into the veins. This method has also been employed on mad dogs: it has not in any case been followed by a cure.

1016. These facts permit us to conclude, that, in the present state of science, no medicine is known which will constantly cure the hydrophobia when declared, and that it is, consequently, indispensable to cauterize the bite with a red hot iron, in order to prevent its developement. This cauterization will be followed by effects so much the more successful, as it shall have been employed the shortest time possible after the bite of the animal.

APPENDIX.

CORROSIVE SUBLIMATE (CHLORURET OF MERCURY).

We have announced, page 60, vol. i. part i., that *Dehorne* had exclaimed with animosity against the absorption of Corrosive Sublimate; he asserted beside, that this substance could not produce death, when applied to wounds or to the cellular texture. Our experiments not agreeing with these results, we affirmed, that death might be the consequence of the imprudent application of this caustic externally. In truth, we thought of being obliged to reject the idea of absorption, in consequence of the experiments and considerations of *M. Brodie* and *Lavort:* at this moment we are perfectly convinced, not only of the danger incurred by the external application of Corrosive Sublimate, but also of its absorption. Our friend and pupil *Dr. Smith,* has put this truth beyond all doubt, by numerous experiments made in our presence, which he has detailed in an excellent inaugural dissertation sustained at Paris, the 15th of May, 1815.*

When from four to eighteen grains of Corrosive Sublimate are applied to the cellular texture of the inside of the thigh of a dog, even when inclosed in a fine linen, sadness, loss of appetite, sometimes vomitings, stools frequently bloody, weakness, general paralysis, are the only symptoms which precede

* *Dissertation sur l'Usage et l'Abus des Caustiques.*

death, which constantly takes place without convulsive symptoms. On opening the body, it is observed that the stomach exhibits at one time an inflammation very evident of the mucous membrane, with a sanguineous exhalation on its interior surface; at other times, black spots; lastly, sometimes ulcerations. The rectum is the seat of two very distinct alterations; at one time it exhibits a remarkable thinness of its coats, which have contracted a livid colour more or less marked, in consequence of the contact of a fluid which is red, blackish, and very fetid, which it usually contains; at other times, and in the greatest number of instances, this intestine is contracted upon itself; and the folds, which the mucous membrane then forms, are red or blackish, either throughout, or only in one point of their extent, and that is most commonly in their superior part. This alteration of the great intestines is met with, both when the poison has been applied to the neck, or injected into the veins. The duodenum has presented sometimes near the pylorus, some spots similar to those which existed in the stomach. The other small intestines have appeared little altered. In one of these experiments, the heart exhibited black spots in its fleshy texture, immediately below the internal membrane of the ventricles. The lungs are frequently the seat of a sensible alteration; sometimes they are distended with a black blood, which does not, however, prevent them from crepitating; more frequently, there are black spots or sanguineous infiltrations existing on the anterior edge of these organs, the centre of which sometimes projects like a tubercle below the pleura.

The same organic lesions have been observed when one or two grains and a half of Corrosive Sublimate have been injected into the jugular vein, dissolved in water.

M. Smith is of opinion, in consequence of these experiments, that the Sublimate injected into the veins, or externally applied, produces death by acting upon the heart, without any primitive lesion of the brain and nervous system; he thinks, on

the contrary, that this lesion does take place when the poison has been introduced into the stomach; at first, in consequence of the nervous phenomena which take place in this case; and afterwards, from the great sensibility with which this viscus is endued.

1017. The following are the experiments which *M. Brodie* has had the goodness to communicate to me, which tend to confirm the action of Sublimate on the heart, without the intervention of the nervous system.

Experiment 1st. A solution of Corrosive Sublimate was introduced into the stomach of a rabbit, of which the nerves of the eighth pair had been cut: the effects of the poison were the same as if the nerves had not been divided.

Experiment 2nd. The nerves of the eighth pair in the neck of a rabbit were cut, and the spinal marrow was divided in the midst of the back; a solution of Corrosive Sublimate was injected into the abdomen: the action of the heart ceased at the same instant.

Experiment 3rd. A small quantity of Corrosive Sublimate was injected into the posterior part of the abdomen of a frog: five minutes after, the heart was no longer contracting, but the sensibility was not diminished; the animal was still somewhat sensible at the end of an hour. The effects of the poison were the same as those which would have resulted from the excision of the heart.

Experiment 4th. The posterior part of the spinal marrow was removed, in such a manner as that the communication of the nerves of the posterior extremities with the rest of the nervous system was completely cut off; a solution of Corrosive Sublimate was then injected between the skin and the muscles of the thigh and leg. The heart ceased to beat seven minutes after the injection of the Sublimate.

Experiment 5th. A solution of Corrosive Sublimate was injected into the abdomen of a rabbit, which was under the influence of the *Woorara*, (vide p. 293, part ii.) and in which

the circulation was kept up by artificial respiration. The heart ceased to act a short time after the injection, just as if the *Woorara* had not been administered; nevertheless, we have seen that the peculiarity of this poison is to destroy the sensibility of the nervous system.

Experiment 6th. The experiment was begun again with this difference, that the spinal marrow was cut in the neck; and the substance of the brain was destroyed by means of an instrument, before making the injection of the Sublimate into the abdomen, whilst the animal was already under the influence of the *Woorara:* the heart ceased to contract as usual.

1018. We shall here relate an observation of poisoning, by the external application of Corrosive Sublimate: it has been communicated to us by our friend *M. Cloquet, Aide d'Anatomie* to the Faculty of Medicine, and Professor of Anatomy: he expresses himself as follows:

Observation.

On the 22nd of May, 1815, about five in the evening, I plunged my hands several different times into a very concentrated solution of Corrosive Sublimate, for the purpose of taking out some anatomical preparations. I forgot to wash my hands, and went about my ordinary occupations. About eleven o'clock, I went to bed without experiencing any inconvenience. About one in the morning, I was awoke by very severe pains, which I felt in the epigastrium; these pains increased very rapidly, and became excruciating. Bending of the trunk eased them a little. They were more particularly felt in the region of the stomach, and seemed to extend over the whole of the diaphragm; the abdomen was somewhat depressed, and pressure was painful in the epigastric region. I felt a sense of constriction all over the breast. My breathing was costal, difficult, unequal; my pulse small, concentrated, irregular; my mouth dry, with tolerably ardent thirst; a copious sweat covered my forehead, temples, breast, and hands,

and I felt in these parts a coldness, which was very troublesome. After being in this state about half an hour, several eructations took place. To these succeeded nauseas; but I made useless efforts to vomit: it was only then that I suspected the Sublimate to be the cause of all these symptoms. I put my fingers into my mouth, and perceived by the acrid taste that I had forgotten to wash my hands, which I hastened to do at the instant; I drank in great abundance sugared water, and about two o'clock procured vomiting, that is to say, an hour after I awoke. The vomitings were at first very violent, and succeeded one another with great rapidity. The matter of the vomitings was glairy, thick, and had a metallic taste extremely acrid, which caused me a painful constriction in the throat. The epigastric region was extremely sensible to the touch, and the slightest pressure occasioned the most severe pains. The vomitings stopped towards half past four in the morning. I then felt some gripings in the umbilical region, and had three stools extremely fluid, and accompanied with tenesmus; about five in the morning I fell asleep, and woke about eight, with the mouth dry, and the skin covered with sweat; but I no longer felt the sensation of cold in the forehead, stomach, and hands; the sickness at the stomach had disappeared, but the epigastric region remained extremely painful. I took during the day only six plates of broth, and three of rice cream; the next day I was able to attend to my occupations: nevertheless, for eight days I preserved a sense of uneasiness in the epigastric region.

Artificial Cinnabar (Sulphuret of Mercury). In the dose of thirty-six grains or a drachm, it produces death in the course of two, three, or four days, when applied to the inside of the thigh: the stomach and intestines exhibit on dissection lesions similar to those we have described in the preceding article; the heart and brain do not appear altered; the lungs sometimes are found distended.

Sulphuret of Arsenic. *Hoffmann* and *Renault* have ad-

vanced the opinion that the native Sulphurets of Arsenic are not poisonous when introduced into the stomach. *M. Smith* has proved that they produce death when applied to wounds. One or two drachms of *native yellow Sulphuret*, when brought into contact with the cellular texture of the inside of the thigh of a dog, occasioned death at the end of two days; the stomach was evidently inflamed; the small intestines exhibited some wrinkles of a red colour. The *native red Sulphuret* has also occasioned death at the end of a few days. The *artificial red Sulphuret*, in the dose of one drachm, twenty-six grains, occasioned, three days after, convulsions, which were shortly after followed by death. There were found near the pylorus some ulcerations, black at the bottom: the interior of the rectum exhibited some red wrinkles and livid tubercles.

Acetate of Copper. This salt, applied externally, in the dose of one or two drachms, produced no accident at the end of seven days.

Verdigris. In the article, *Treatment of poisoning by Verdigris*, we have described the experiments made by M. Duval for the purpose of ascertaining the efficacy of sugar as an antidote to this poisonous substance: we have given also those which we have tried ourselves with the same intention, and we have come to the conclusion that sugar ought to be regarded as the antidote of Verdigris, an assertion which had been made several years before by *M. Gallet*, Ex-Apothecary-General to the armies. In examining the chemical action which sugar powdered is capable of exerting upon this salt, we found that the latter became decomposed; and we proposed to ourselves to study the phenomena and the results of this decomposition. (Vide vol. i. part i. p. 235.) We then undertook a chemical labour on this subject, and found that sugar, at the temperature of boiling, decomposed rapidly the solution of Verdigris, and converted it into a prot-oxyde of copper of an orange-yellow colour, and into acetic acid, which was set at liberty. Several vegetable substances, such as gum, certain oils, &c.,

effect the same decomposition. We communicated these experiments to the pupils attending our course, and repeated them in their presence. It was our intention to have published them, when we learned that *M. Vogel* had just presented to the first class of the Institute a very excellent memoir on this subject, and that the results he had obtained were conformable to our own. In reflecting on the phenomena of this decomposition, which only takes place with rapidity at the temperature of boiling water, we had great difficulty in conceiving how the sugar could decompose the Verdigris in the stomach; a circumstance essential to its being considered an antidote: in consequence of which we tried fresh experiments; being convinced by subsequent researches, that those we had already published were not sufficient to pronounce with certainty; because, according to our own maxim, the name of *counter-poison* cannot be given but to such substances as oppose the effects of the poison, *the œsophagus being tied.*

Experiment 1st. Fifteen grains of Verdigris were treated by boiling water, and mixed with six ounces of water saturated with sugar: the mixture was introduced into the stomach of a dog, and the œsophagus was tied. The animal experienced all the symptoms of poisoning, and died at the end of nine hours. The digestive canal exhibited an extensive inflammation, in every respect similar to what the Verdigris would have produced, if administered alone. The fluid contained in the stomach was analyzed, and it was ascertained that the salt of copper had not been decomposed, for it yielded a copious black precipitate with the hydro-sulphuric acid, a brown one with the prussiate of potash and of iron. This experiment was six times repeated with the same results.

Experiment 2nd. A strong dog was made to eat eight ounces of raw sugar; immediately after, twelve grains of Verdigris, dissolved in four ounces of water strongly charged with sugar, were introduced into the stomach: the œsophagus was tied. An hour after, the animal experienced already the

symptoms of poisoning: he was made to take six ounces of sugar dissolved in water; the symptoms acquired a greater degree of intensity, and death supervened two hours after the ingestion of the poisonous substance. The stomach and rectum were strongly inflamed, and the coppery salt had not been decomposed. This experiment was repeated five times, and furnished similar results.

Convinced by these facts, that sugar cannot be an antidote to Verdigris, we wished to know whether its administration would not be useful for quieting the irritation produced by this salt. To this end, several animals were made to take from eight to twelve grains of Verdigris, and they were left the power of vomiting; some of them were neglected, and died. To others were given a great quantity of sugar and sugared water divided into a number of doses frequently repeated, and very good effects resulted from it.

1019. It results from these experiments:

1st. That sugar exerts no chemical action on the Verdigris that has been introduced into the stomach; that it does not prevent it from acting as a caustic, and consequently is not its antidote.

2nd. That it is useful for calming the irritation produced by this poison, when it has been previously expelled by vomiting.

3rd. That the different instances of cures of this kind of poisoning which have deservedly given to the sugar the title of *specific*, are naturally explained, by taking into consideration that the Verdigris had been vomited, or had been taken in very small quantity.

The real advantages presented to us by albumine, in opposing the effects of corrosive sublimate, and the great facility with which this animal substance decomposes Verdigris, even at the ordinary temperature, induced us to try fresh experiments, which have been followed by the greatest success.

Experiment. The œsophagus of a robust dog of mid-

dle size was detached and perforated: thirty-six grains of Verdigris dissolved in three ounces of boiling water, and mixed with six whites of egg perfectly diluted in eight ounces of water, were introduced into the stomach:* the œsophagus was tied. At the end of five hours, the animal had passed several mucous stools, mixed with a substance of a greenish white colour, which was found on examination to be the precipitate formed by the albumine and the metallic oxyde. Five hours after, more stools. Five days after the operation, the animal had not experienced any remarkable phenomenon; he was somewhat dejected. The dejection increased on the two following days, and he died at the end of the seventh day. The opening of the body took place next day, and it was impossible to discover the least trace of alteration in the digestive canal. This experiment, repeated eight times, with doses of Verdigris which varied from twenty-eight to thirty-six grains, constantly gave the same results. The same thing took place when the metallic solution was first introduced, and a minute or two after, that of the albumine; in this case the animals made efforts to vomit. It is evident, that this dose of Verdigris administered by itself, would have produced death at the end of one or two hours, and that the stomach would be found highly inflamed; from which circumstances we ought to conclude that it was decomposed by the albumine, converted into a substance incapable of doing mischief, and consequently that this is one of its antidotes.

Should it happen, that a person has swallowed a strong dose of one of these soluble coppery salts, it will be necessary immediately to attempt its neutralization by means of albumine.† In case the quantity of the poison ingested should be very

* It was ascertained, by the prussiate of potash and of iron, that the solution of copper had been completely decomposed by the albumine, and that the whole of the oxyde was precipitated with the animal matter.

† All the soluble salts of copper are decomposed by this animal substance.

small, and there should be every reason to believe that it has been expelled by vomiting, sugar and its various preparations should be had recourse to: for the rest of the treatment, the principles laid down in the 1st Part of Vol. I. should be observed. *(Vide Art. Verdigris.)*

We have also made experiments with the prussiate of potash and of iron, a double salt which possesses the property of decomposing instantly the preparations of copper; the results were the same as with albumine; but as this double salt is not within the reach of every one, and as it may produce vertigoes when administered in a full dose, we recommend in preference the whites of eggs diluted with water.

Concentrated Acids and *Caustic Alkalies.* It was easy to foresee that these corrosive substances would not be absorbed when applied to the cellular texture: for this reason we have omitted to report in our first volume the experiments which we have made on this subject. The same thing happens with the Nitrate of Silver, butter of Antimony, Sulphate of Copper, and Calcined Alum.

Sulphate of Zinc. *M. Smith* has proved that the action of this salt is not uniform when externally applied. In the dose of thirty-six grains, it has destroyed animals; two drachms have not produced, on others of the same size, any thing more than vomitings, and some other symptoms, which have disappeared in the course of a few days.

Sulphate of Iron. This salt has exhibited to the same physician poisonous properties sufficiently energetic. When applied in the dose of two drachms to the cellular texture of the inside of the thigh of two dogs, it killed them in the course of twelve or fifteen hours. On opening the bodies, the internal surface of the stomach of one of them was found covered with a very great multiplicity of petechial spots. The wrinkles of the rectum were numerous and black; the liver whitish, with livid spots on its convex surface: the other exhibited a great quantity of black fluid blood in the stomach,

the membrane of which had contracted a livid colour from the presence of the blood; in other respects, no alteration or spot: a tolerably considerable quantity of the same fluid was found in the duodenum and small intestines, the mucous membrane of which was of its natural colour beneath; a very slight redness of the folds of the rectum; the heart contained black grumous blood, and some slight livid blotches in both ventricles.

When introduced into the stomach in the dose of two drachms, this salt did not occasion death in less than twenty-six hours, and without any other apparent symptom than a general insensibility; the interior of the stomach exhibited red spots, elongated; the small intestines presented blackish puffy swellings; the upper part of the rectum shewed red folds.

Muriate of Ammonia (Sal Ammoniac). This salt, which formerly entered into the composition of the *Lapis Infernalis* of *Fallopius,* and into the *Unguentum Cathereticum* of *Barbette,* is poisonous when applied externally. *M. Smith* applied to the cellular texture of the thigh of a small dog, one drachm and twenty grains of this salt. At the end of an hour and half, the animal experienced a sensible uneasiness; he was feeble, and vomited frothy mucosities. At the expiration of two hours, the weakness was so great, that he was scarcely able to support himself; he appeared to be drunk. Five hours after the application, he stood a little better on his feet; the vomitings had not returned, but the weakness increased, in such a manner, that he died twelve hours after the application of the poison: no vestige of it could be discovered under the skin of the limb operated on. The mucous membrane of the stomach exhibited towards its splenic extremity a multitude of small gangrenous ulcerations; the part corresponding to the pylorus was evidently inflamed; there was found throughout the whole digestive canal a blackish fluid extremely fetid; the rectum exhibited a red spot of no great extent; the heart preserved its natural consistence; in the left ventricle, were

three small red spots, which extended about a line into the fleshy texture; the anterior part of the lungs presented here and there some red spots.

Another dog died in thirty-six hours, in consequence of the external application to the thigh of two drachms of the muriate of ammonia. The mucous membrane of the stomach at its splenic extremity, was reduced to a state of putridity; pieces of this membrane were floating in a mucous fluid, which was in tolerable abundance; the small intestines and rectum, were just as in the preceding experiment: on the outside of the base of the right ventricle of the heart, there was a sanguineous effusion into the fat which divides it from the auricle; this effusion extended into the fleshy texture.

OF CHARCOAL, WHICH HAS LATELY BEEN CONSIDERED AS THE ANTIDOTE TO CERTAIN MINERAL SUBSTANCES.

1020. We published, in an Appendix to the 2nd Part of the 1st Volume, numerous experiments, which demonstrated in the most rigorous manner, that Charcoal was not the antidote of corrosive sublimate, nor of the white oxyde of arsenic (arsenious acid) as *M. Bertrand* had pretended. In a Memoir recently printed, this physician persists in considering Charcoal as an antidote to these two metallic preparations, and he relates some observations which appear to him to prove, that it is equally so to verdigris.* This assertion did not at all surprize us, as *M. Bertrand* had said, in his first paper, that it is probable that Charcoal is the antidote to a very great number of metallic salts. We are of opinion, that it is extremely dangerous to propagate errors of so serious a nature; full of confidence of obtaining similar results, physicians may put in practice these inefficacious means, and lose much precious time, in

* *Journal Général de Médecine*, redigé par Sedillot, Avril, 1815, p. 363.

circumstances where there is not a moment to be lost. This has induced us to recur again to this topic, in order to demonstrate that *Charcoal* is not, nor can possibly be, the antidote to any metallic substance.

The word *antidote,* has, amongst many physicians, two different acceptations : at one time, they give that name to a substance capable of decomposing rapidly the poison in the stomach, and of forming with it a substance that is insoluble, and destitute of any action upon the animal economy; at another time, they apply it to every medicine which, without any kind of power of decomposing the poisonous substance, diminishes the effects to which it gives rise, quiets the symptoms of the disease, and is even capable of putting an end to them altogether. It is unnecessary to shew how little the denomination of an antidote is applicable to these medicines. For instance, is it not absurd to say, that leeches are the antidote to corrosive substances, because they have frequently, when applied to the belly, put an end to the symptoms of inflammation which had succeeded to the ingestion of some corrosive poison? And how many more instances of this kind could we not adduce? But let us not dispute about terms : let us come fairly to the question, and prove the inefficacy of Charcoal as an antidote, whatever acceptation *M. Bertrand* may give to this word.

Charcoal does not possess the power of decomposing at the temperature of 32°, *any of the three metallic preparations in question.* The most simple reasoning is sufficient to demonstrate this proposition. Let us take for instance the arsenious acid (white arsenic). The most decidedly elementary works on chemistry teach us, that this acid is extremely volatile ; and that in order to decompose it by means of Charcoal, it is necessary to fix it by means of an alkali (metallic oxyde) or a soap, which contains soda or potash ; and beside, it is not until it has been heated to redness that this decomposition takes place. It is then impossible that this effect should take

place in the stomach. But, it may be said, the vital powers will supply the place of temperature and of alkali, the stomach is not a chemical vessel; and *M. Bertrand* must necessarily partake in this opinion, since he says in his last Memoir, when he is endeavouring to make it understood how Charcoal can possess the virtue of an antidote, "that this substance carries off by means of heat, the oxygen of the greatest number of bodies, reduces metals, and becomes oxydated at a low temperature." (p. 369.) Since then this heat is insufficient, *M. Bertrand* must reckon upon the vital powers.

For too long a time, those physicians, who have too much neglected the study of chemistry, have obstinately persisted in having recourse to powers of this kind, whilst they stand for nothing in explaining the phenomena which they endeavour to understand. It is for them a very considerable resource, and frequently a word devoid of meaning. There is nothing to do here with the vital powers; the operation is entirely within the province of chemistry. Let any one introduce into the stomach of an animal six grains of arsenious acid, mixed with sixty grains of Charcoal, and three or four ounces of Charcoal-water; let them tie up the œsophagus, in order to prevent vomiting; and then let them analyze the fluids found in the digestive canal after death; they will find the arsenious acid, and not an atom of metallic arsenic; therefore the phenomena have taken place just as if the mixture had been made in an inert vessel, the temperature of which was the same as that of the stomach; *that is to say, that the Charcoal has not decomposed the poison.*

We might produce again the same arguments in regard to *corrosive sublimate* and *verdigris.*

Now let us consult experience. Not a single fact will be produced in which Charcoal or Charcoal-water had prevented the death of animals that had taken a sufficiently strong dose of one of these poisons, and whose œsophagus was tied: all, on the contrary, have died after experiencing the symptoms which

these poisons would have produced, had they been taken alone. We shall avoid giving the details of the numerous experiments which have enabled us to announce this important fact. How could that have taken place, if the Charcoal had effected their decomposition? Let us compare the results of these experiments with those we have obtained, by giving solutions of sublimate or verdigris with albumine, the muriate of tin with milk, the acetate of lead with a soluble sulphate, the nitrate of silver with the muriate of soda. Under all these circumstances the poison is decomposed in the stomach as at the ordinary temperature: so also the animals do not experience any of the symptoms of poisoning, they live several days, and only die from the effects of the operation and of hunger; the digestive canal in them exhibits no trace of inflammation, when the antidote has been administered in sufficient quantity.

*It is then proved, both by theory and experiment, that Charcoal does not possess the power of decomposing, at the temperature of 32°, any of these three metallic preparations, either in the stomach, or elsewhere.**

2nd. *Charcoal is not a medicine capable of diminishing the effects produced by corrosive sublimate, arsenious acid, and verdigris; it cannot cure the disease which they produce.* Physiology and pathological anatomy teach us, that the affection produced by these corrosive substances, is an inflammation more or less intense of the texture with which they have been brought in contact, an inflammation followed, or accompanied, by a lesion of the nervous system. Now, how long has Charcoal been considered as a specific for inflammatory diseases? In what work on Therapeutics do we see it flourishing amongst the antiphlogistics of the first order? These considerations already allow of raising doubts concerning the

* There is no occasion to state here, that in order to draw a similar conclusion, the poison must necessarily be a long time in contact with the pretended antidote, that is to say, that neither of them ought to be vomited, so that it is an indispensable measure to tie up the œsophagus.

utility of this medicine, in these kinds of diseases. But experience proves, in a manner incontestable, that it is not endued with any virtue. We have frequently given to animals, a dose of these poisons sufficient to produce death, in ten, twelve, fifteen, or eighteen hours; a short time after their ingestion, we caused them to take the powder of Charcoal, and Charcoal-water; we have repeated every quarter of an hour, up to twenty-five and thirty times, the doses of this medicine, without being able to obtain the least success. Indeed, we have succeeded in restoring the health of dogs, that had only taken a small quantity of poison, and which nevertheless exhibited symptoms of poisoning; but a mucilaginous emollient fluid has produced the same effect; and frequently even they have recovered their health, when not the least assistance has been given them; a proof that the dose of poison ingested, has not been sufficiently strong to produce death.

1021. It results from these facts,

That neither Charcoal, nor Charcoal-water, present any particular advantage in cases of poisoning by corrosive sublimate, arsenious acid, or verdigris, and probably the other metallic solutions; and that the whole of the facts on which M. Bertrand supports his opinion, as to the efficacy of Charcoal, is very far from being sufficient to carry conviction to a mind ever so little just.

1022. It would not be amiss to quote here the new observation which this physician brings forward in favour of Charcoal. In this observation it was not ascertained, by analysis of the fluids, that the poison existed, and they pronounce that the Charcoal has acted as an antidote! A case of poisoning is admitted, where frequently there is only an indigestion, a *cholera morbus*, or any other disease.*

* We think it ought to be observed, that observations similar to those reported by *M. Bertrand* in his last memoir, and to that published by *M. Sézane*, in the *Annales Chimiques de Montpellier*, were they even a thousand times more numerous, prove nothing for or against the question; they can

"On the 1st of February, 1815, at noon, *Madame B**** sixty-seven years of age, her daughter, thirty-nine, and her servant, of the age of twenty-two years, ate of a fricasseed fowl, which had been cooked in a saucepan badly tinned, with the water which had been boiled, and remained sometime in a coffee-pot of red copper, likewise deprived of its tin. Towards evening, and during the night, *Madame B****, and especially the young lady, who was of a decidedly delicate constitution, made vain attempts to vomit; they experienced the following symptoms; styptic taste and dryness in the inside of the mouth, thirst, severe pains of the epigastrium; gripings, followed by several whitish stools. The night was passed in this state, and without any suspicion as to the cause of the symptoms, which these ladies attributed to indigestion. The next morning, the symptoms of the evening before appeared more decided, and they acquired so great an intensity in the young lady, that she became a prey to general convulsions, a painful and tense swelling of the abdomen, and repeated faintings. *Madame* and *Mademoiselle B**** felt coppery eructations, and violent gripings, with tenesmus, and followed by greenish liquid stools. *M. Colier*, a surgeon, recommended infusions of tea, sugared and emollient fomentations to the belly, which were continued the whole morning without any success. At his second visit, being informed of the material

only be available, as far as they acquire a certitude, by analysis, that the poison has been swallowed, that it has not been entirely vomited, and that the pretended antidote has converted it into a substance incapable of doing harm. So likewise are we thoroughly convinced, that dogs, on whom all sorts of experiments may be made, and that can be hindered from vomiting, will furnish always results much more proper for illustrating discussions of this kind. The objections that may be made from the difference of organization between men and dogs, fall of themselves when it is recollected that it concerns corrosive substances which act chemically, and in the same manner on the organic texture, as may be demonstrated by comparing the symptoms, and, above all, the lesions after death, which they produce in these two species of animals.

cause of the symptoms, by a closer examination of the circumstances that could be recollected to have preceded them, and especially by an inspection of the saucepan, and of the inside of the coffee-pot, where he perceived here and there some remains of verdigris not dissolved, he proposed milk and oily medicines, which were not made use of, but were replaced by infusions of the flowers of the *Tilia* sugared, alternated with the tea, which had also the addition of sugar. From time to time, a few drops of the liquor of Hoffmann were given in turns with the liquid laudanum of Sydenham, on sugar. The fomentations were continued the whole day. On returning the 2nd of February, from my daily round, I was called in to the patients, whom I found in the following situation: the mother experienced a great deal of heat and dryness of the mouth, and along the whole course of the alimentary canal; a styptic metallic taste; a sense of heat in the epigastrium; frequent gripings, followed, at increasing distances, by liquid and greenish stools; a painful swelling of the abdomen, some anxiety, a general sinking, palpitations to which she is very subject; her pulse had but little re-action, and presented some irregularities. The servant girl, who was strong and vigorous, exhibited the same series of symptoms, with a more decided strength of pulse, and gripes which gave rise to stools more copious, and of the same nature.

"The young lady was likewise a prey to all this train of symptoms, with this difference, that she still felt coppery eructations, intolerable pains in the epigastrium and in the abdomen, without any stools; she experienced a violent headache, faintings, cold sweats; her countenance denoted an attack made on the radical powers of life; her pulse was extremely tight, small, and at times irregular.

"From all the information I had obtained, and the evidence of the above-mentioned symptoms, I became certain that I had to deal with a case of poisoning by verdigris.* I directed

* We must confess, after having made more than two thousand experi-

from that moment my attention to the employment of sugar in substance in a strong dose, or to the albumine formed of white of eggs, which had perfectly succeeded with me in my *zootomic* experiments, made in 1811 with this preparation of copper; but I was somehow *mechanically* led to have recourse to Charcoal. I prepared a strong solution of Charcoal of the walnut-tree, in eight ounces of water, in which I suspended half an ounce of the same powder well sifted, some sugar, and distilled water of orange-flowers. The mother took a spoonful of it every half hour, and the young lady every quarter of an hour. Madame B*** experienced a sensible effect, and manifest amelioration of all the symptoms mentioned, from the third dose of the mixture; and her daughter was so much relieved after the fourth, that she told me a few minutes after, *you have applied a balsam to my stomach.* I continued the same mixture during the night, but at longer intervals. These ladies enjoyed a tranquil sleep; and the mother passed a greenish liquid stool. The servant girl, not being willing to take the mixture in the evening, experienced, during the night between the 2nd and 3rd of February, severe gripings, accompanied with yellow and greenish liquid stools. Being perfectly resigned in the morning of the 3rd, to submit to the same treatment, she reaped from it, as well as the ladies, the most satisfactory success." (Page 363, Memoir quoted.)

We shall not attempt to refute *M. Bertrand,* when he asserts that the difference of the results obtained by us with corrosive sublimate and arsenic, depend on saline principles with a calcareous base contained in the spring-water, in which he had dissolved these substances, whilst we had effected this solution with distilled water. The solid arsenious acid does

ments on poisons, that these *data* do not appear to us sufficient to acquire that certainty which *M. Bertrand* speaks of; and we are of opinion, that the great Juridical Physicians of our times would be far from concluding before the tribunals, that there had been, in this case, poisoning by verdigris.

not decompose the salts of lime, dissolved in spring-water; its deleterious action is not even diminished by its mixture with lime-water. (*Vide* the experiments we have published in the 1st part of Vol. i.) As to the corrosive sublimate, it continues to act, even when dissolved in water containing calcareous salts.

Oxalic Acid. We have classed this acid amongst the corrosive poisons. (*Vide* vol. i., part 2nd, p. 373.) We did not report the experiments we had tried in order to determine its effects on the animal economy, because they were similar to those of which we had given the details in the history of the sulphuric and nitric acids. The following important observation has been published since the printing of our 1st volume.

Miss. M. P. about forty years of age, swallowed, instead of sulphate of magnesia, half an ounce of *oxalic acid* dissolved in water. She felt immediately inexpressible pains in the belly; the face became shrivelled, the pulse imperceptible; she vomited a dark coloured fluid, passed a very copious liquid stool, and expired in forty minutes.

Opening of the body. The stomach contained twelve or fourteen ounces of a dark coloured fluid; its mucous membrane, which was injected, and red throughout its whole extent, exhibited a considerable thickening, with patches; the muscular coat was contracted, and exactly divided into two portions; one cardiac, the other pyloric: the serous coat was also injected. The ileum was strongly inflamed a few inches from the colon: the colon was contracted throughout its whole extent, but without any appearance of inflammation; considerable effusion of a limpid fluid between the arachnoid membrane, and the pia-mater, which formed between these two membranes a separation of nearly three lines. The medullary substance of the brain was whiter than usual, and the choroid plexus paler than what it mostly is in cerebral congestions.*

M. Hume has thought to be able to explain the death of

* *Bibliothèque Médicale*, tome xlvi; October, 1814, p. 121.

this person by the decomposition of the phosphate of lime, which constitutes a part of the coats of the stomach. This chemical explanation is totally void of foundation, for it is a well attested fact, that the oxalic acid, when made to digest for an hour on phosphate of lime at the temperature of 40°, exerts no sensible action upon it. How greatly it is to be wished, that chemists would cease to make extravagant applications of the science they profess to medicine, and that they would confine themselves to the explanation of the phenomena which lie entirely within their own sphere; this would without doubt, be the most effectual method to persuade clinical physicians, that real advantages may be drawn from the study of chemistry.

OF THE *CURARE*.

The *Curare* is as celebrated in the Oroonoko as the *Ticunas* is in the valley of the Amazon. Both are used for poisoning the arrows. There are several species of the *Curare;* the strongest is that of Mandavaca, a village which unites the Oroonoko with the Rio-Negro, that of Vasiva, and that of Esmeralda. According to *M. de Humbold,* to whom we are indebted for these details, the real *Curare* proceeds from a climbing plant called *Vejuco de Mavacure,* the genus of which he was not permitted to determine. It is the bark of the Mavacure, which contains this terrible poison. The juice of this bark is yellowish; it is concentrated by means of fire; when it has acquired the consistence of a syrup, they mix in with it the still more glutinous juice of the *Kiracaguero* tree, which is not poisonous, but gives more body and consistence to the *Curare.* This latter is of a blackish brown colour, and resembles opium. When it is well prepared, they keep it three or four years; but in general it is extremely active only when fresh.

The *Abbé Gilij*, in his history of America,* says, p. 353, that he has been an eye-witness of the surprising activity of this poison: the strongest animals die in a very short space of time, when wounded with arrows impregnated with the *Curare*. Its whole action, he adds, is exerted upon the blood, which it is believed to coagulate. It may be kept in the mouth without danger; it does no harm when applied upon the gums, unless they should happen to bleed, from some cause or other. A bird, stag, monkey, or any other animal, killed with the *Curare*, may be eaten with impunity. Diluted with water, this poison produces no symptoms, or at least its strength is found to be very considerably weakened; the moisture of the atmosphere equally produces this effect, and *Gilij* has observed, that the Indians put the arrows into their mouth in order to warm them before discharging them.

Oviedo, in his work entitled: *Sommario dell' Inde Occidentali*, chap. 78, says, " All the Christians are of opinion, that sea-water, with which they wash the puncture, is the best remedy that can be employed by those who have been poisoned by the *Curare;* some have been restored by these means, but it is the smallest number. *Gilij* says, that in Oroonoko the Spaniards employ with success, common salt and urine to combat the effects of this poison. *M. de Humbold* believes also, that the muriate of soda is a powerful remedy in this species of poisoning.

There is beside another species of *Curare*, which the missionaries call *Curare Destemplado*, because it is weak. It is with it that they tip the arrows which they make use of for catching small monkeys. The animal, whose life they wish to save is scarcely hurt: he faints however from the effects of the poison, and they cure him by introducing muriate of soda into

* *Saggio di Storia Americana descritta dall' Abate Filippo Salvadore Gilij*, tom. ii. Roma, 1781.

the wound, and rubbing him with this salt. Unfortunately it is very scarce and very dear at Oroonoko.

The following are a few particulars communicated to us by *M. Humbold*, with respect to some other poisons.

" On the river of the Amazons, we have seen the poisons of Moyobamba, of Peca, and of Lamas. The strongest is that of the Indians, *Ticunas*, which is only the juice of a climbing shrub, of the island of Mormorotte, which has been concentrated by evaporation. It appears that all these poisons are derived from different climbing plants. In taking a drawing, during my stay at Guayaquil, of the fruit of the *Vejuco de la Peca*, which had just been sent me from the Amazon, I experienced a numbness in my hands, only from having handled the plant during the violent heats of these climates. The most celebrated antidote against the poisons of the river of the Amazons is sugar."

OF THE LIGATURE OF THE ŒSOPHAGUS.

We have frequently had recourse, in our experiments, to this operation, because we have considered it indispensable to the obtaining rigorous results. A number of learned men, both Frenchmen and foreigners, in taking notice of the 1st volume of our work, have asserted, that an operation so painful must produce serious symptoms, and consequently that the results we have obtained, were not so conclusive as they were disposed at first to think them. But could we have devoted ourselves to such labours without being well assured, by rigorous experiments, of the influence of this operation? These have demonstrated to us, 1st. That the conclusions we have drawn, ought not to receive any modification on account of the ligature of the œsophagus. 2nd. That it is impossible to write a complete work on poisons, without practising it frequently.

EFFECTS OF THE LIGATURE OF THE ŒSOPHAGUS UPON DOGS.*

Experiment 1st. Four dogs of middle size, who had been refused food for two days, were operated on February 17th, at two in the afternoon: each operation scarcely lasted two minutes. At the end of an hour, these animals were as active as before the operation. On the 23rd, at ten in the morning, they had not experienced any remarkable phenomenon; they were only a little dejected. The next day, they appeared feeble, but still preserved the power of walking without staggering; their intellectual faculties were free, the pulsations of the heart somewhat weak. They died within the thirty-six hours which succeeded, without exhibiting the least convulsive movements. A few hours before death, they were lying down on the side, and were insensible.

Examination of the bodies. The ventricles of the brain contained no serosity; the external vessels of the right lobe were only a little distended with black blood; the lungs were of a fine rose colour, and presented on their surface a few brownish spots; the heart was somewhat softened, and contained coagulated blood; the mucous membrane of the stomach presented here and there a few spots of a rosy colour; there was near the pylorus a small ulcer of the size of a lentil, the edges of which were black; all the intestines were tinged yellow by the bile, but exhibited no lesion. The other organs were the same as in their natural state. These animals had remained eleven days without eating or drinking.

Experiment 2nd. A robust dog of middle size underwent

* It is unnecessary to observe, that we intend to speak here of the ligature of the œsophagus performed skilfully; in this case, it does not last longer than a minute, or a minute and an half. Certainly, the effects of this operation might be extremely serious, if, by ignorance or unskilfulness, the animals were tormented for fifteen or twenty minutes, before they had been able to effect it.

this operation the 11th of February, at ten in the morning: he had been fasting for two days. The next day, his pulse was somewhat accelerated, the pupils in their natural state, and he showed no vertigoes, paralysis, nor convulsive movements: so likewise he walked about as freely as before the operation. On the 13th, at three o'clock, he was in the same state, but had an ardent thirst. On the 14th, *fruitless efforts to vomit*, lying down *on the side*, great weakness, slight vertigoes, pupils in their natural state: death in the course of the night.

Inspection of the body. The stomach contained only a small quantity of yellow bile; the folds formed by its mucous membrane exhibited a violet colour, which is frequently met with in healthy dogs; between these folds were observed some rose-coloured spots; there was neither ulcer nor slough; the rectum was in its natural state, except that it exhibited here and there some red spots, which the scalpel removed by the slightest pressure; the rest of the digestive canal (except at the part operated on,) was sound. The lungs were crepitating; they were of a reddish colour, and contained a certain quantity of blood, especially towards the left lobe, the surface of which appeared black. The heart, brain, and other organs were the same as in the preceding experiments.

Experiment 3rd. This operation was performed on the 11th of February, at ten in the morning, upon a small robust dog that had been caught the evening before. The next day, the pulse was rather more frequent than before the operation. On the 12th, the animal began to be thirsty: The 13th, he walked about freely; the organs of sense and intellectual faculties in their natural state; slight dejection. The 17th, at three in the afternoon, lying down on the side; impossibility of supporting himself on his legs; slight convulsive trembling in the feet; inspirations excessively deep: he was dead two hours after. This animal exhibited no sign of paralysis nor vertigo during the seven days that he lived; he made no ef-

forts to vomit; the dejection went on increasing to the last moment.

Dissection. The mucous membrane of the stomach was tolerably red throughout its whole extent; it exhibited, near the pylorus, four ulcers of the size of small lentils; there were in the rectum a small number of red spots; the other portions of the intestinal canal appeared sound. The lungs were of a rose colour, somewhat deep, and contained only a very small quantity of blood; they were crepitating. The state of the heart, brain, and other organs was not different from those in the preceding experiments.

Experiment 4th. Six robust dogs of middle size were operated on the 22nd of March, at ten in the morning. Forty-eight hours after, they began to be somewhat dejected, but had not experienced any remarkable symptom. They were then hanged, that they might die in a state of *asphyxia,* and the bodies were opened an hour after. The stomach and intestinal canal *exhibited no sensible alteration*; the other organs exhibited the lesions which are found in bodies that have died of *asphyxia.*

1023. It results from these twelve experiments:

1st. That the ligature of the œsophagus in dogs constantly produces, during the two first days, nothing more than a slight fever and a little dejection, which is incapable of killing them in so short a time.

2nd. And that, if at this period, the animals be killed, no lesions will be discovered on dissection.

It is then evident, that an animal that has been made to take a poison a short time before the ligature is made on the œsophagus, and that should die in the course of the two first days, after having experienced serious symptoms, such as vertigoes, convulsions, pains, or insensibility, vomitings, &c., would not have experienced these symptoms but for the ingestion of the poison. What confirms the justice of this statement in a manner beyond all dispute is, that when there has been given

to other animals that have not had the œsophagus tied, an equal dose of the same poison, which has not been vomited, the same symptoms have taken place, the disease has advanced with the same rapidity, and the results have been identically the same. These comparative experiments may be made by giving *Nux Vomica*, Camphor, *Upas-Tieuté*, *Angustura Pseudo-ferruginea*, and any other substance that is not vomited. It is, moreover, beyond all doubt, that all these alterations discovered after the death of animals poisoned that have had the œsophagus tied, and that die within the eight and forty hours after the application of the ligature, ought to be attributed to the poisonous substance, since the operation itself does not produce any during that period, except in the part operated on. Let any one judge, now, what influence the ligature of the œsophagus has been able to exert on the animals to which we have given poisons, and which died two, four, eight, twelve, or twenty-four hours after: now, this number comprises at least seven-eighths of those we have experimented upon.

3rd. That the fever and dejection increase during the third, fourth, fifth, and sixth days, and until the moment of death; that it happens sometimes during this interval, that vertigoes, and attempts to vomit make their appearance, and even some very slight convulsive movements; lastly, that after death there are discovered in several of the organs lesions more or less profound. However, frequently enough, the animals die in a state of great insensibility, without having experienced any of the above enumerated symptoms. It is certain, that in cases where the poison would act but slowly, it would be difficult after death, to determine whether the symptoms and lesions observed, depended on the poisonous substance, or on the operation. In this case, the operation of the œsophagus might lead one into error, and no confidence could be placed in the results furnished, only as far as the same effects could be obtained by administering the poison without tying the œsopha-

gus. This is precisely what we have done, every time such a circumstance presented itself: so likewise are we perfectly assured, that this element stands for nothing in the solution of the different problems we have endeavoured to resolve.

We are now about to prove *that this operation is indispensable, for studying a poison under all its relations.*

1st. If we are desirous of knowing the action that poisonous substances exert on the animal economy, we must necessarily bring them in contact with the stomach and cellular texture, compare the different phenomena they exhibit, and afterwards draw conclusions. Now, should this substance be of the number of those which are vomited immediately after their introduction into the stomach, how shall we observe their effects? Should we not be tempted to look upon it as but little hurtful, and expose ourselves to commit the most serious mistakes? How many facts could we not produce peculiar to ourselves, in favour of this assertion? But we shall give the preference to emetic tartar. Was the mode of action of this medicine so generally employed, known before our friend *Dr. Magendie* had forced the poison to remain in the digestive canal, by tying the œsophagus? The utility of this ligature for physiological researches of this kind, appears to us so evident, that we shall dispense with making any further remarks upon it.

2nd. That department of Toxicology relating to medical jurisprudence, likewise derives real advantages from the ligature of the œsophagus. How could we without this operation, determine the lesions of dead bodies, which certain medicines that most commonly are vomited, are capable of producing; but which, perhaps, in certain individuals happen not to be vomited?

3rd. But in no case does this operation become so necessary, as when the question is to ascertain the virtue of antidotes. We dare to assert, that this part of the science has only existed since the moment when the ligature of the œso-

phagus was put in practice. A medicinal substance can only be regarded as an antidote of any poison, inasmuch as that it acts upon it in the stomach, that it effects its decomposition, and that there results from it a production incapable of injuring the organization. Now, is it not by the assistance of this operation alone, that we can prevent certain poisons from being vomited, and oblige them to remain in contact for a greater or less length of time with the real or supposed antidote? Men of sound judgment will easily perceive the little exactness of the conclusions drawn by different writers, on the existence or non-existence of an antidote, that has been thrown up with the poison a short time after its ingestion; and they will agree, that the ligature of the œsophagus alone, is capable of preserving us from the errors that may be run into in this respect.

4th. We shall prove hereafter, that this operation is moreover indispensable for making the experiments, in which dogs are made to take the substances contained in the digestive canal of persons, who are said to have died from poison. How often has it not happened, in fact, that in making these animals swallow such substances as these by the mouth, that a portion falls into the trachea, and death takes place immediately, by reason of the asphyxia that they produce. Does it not also happen, when we have succeeded in introducing them into the stomach, that they are completely vomited; in which case, no result that is conclusive is furnished.

SECTION II.

OF POISON, GENERALLY CONSIDERED.

CHAPTER I.

OF THE PROPER MEANS FOR ASCERTAINING THE EXISTENCE OF POISONING.

ARTICLE 1st.

Of Diseases that might be confounded with Acute Poisoning.

1024. IN giving the history of the different poisons, we have remarked, that they all possess a common character, that of producing a series of symptoms more or less serious, a short time after their ingestion into the stomach, or their application to denuded surfaces; sometimes the symptoms follow very closely after the introduction of the deleterious beverage; sometimes several hours elapse before its effects can be distinctly ascertained. Now, since there are a very considerable number of spontaneous diseases, the invasion and symptoms of which resemble poisoning, and make their appearance often enough a few hours after a meal, it follows, thence, that ignorance, interest, or crime, may, under certain circumstances, confound, or seek to confound, one or other of these spontaneous affections, with the real case of poisoning, and compromise the safety, or even the life of the most respect-

able persons. Alas! how often have we witnessed, even in our own days, processes of this kind altogether scandalous, in which have been seen men bearing the title of Doctor, drawing up with the most consummate ignorance extravagant reports, in which, with perfect *sang froid* they accuse the purest innocence, and hurry it to the scaffold. It is sufficient for these *soi-disant* physicians, in order to decide on the existence of poisoning, and even on the particular nature of the poison, to learn, no matter by how ill an observer, that a person has died suddenly, that he experienced vomitings or bloody stools, gripings, &c.; and that on opening the body, lesions have been found in the different organs. Completely ignorant of the numerous facts relative to the profound alterations of a number of the textures which have been frequently discovered after the sudden death of persons who have sunk under spontaneous diseases, they affirm confidently without any respect for the names of *Morgagni, Hunter, Boerhaave, Van Swieten, Bonetus, Lieutand, Chaussier,* &c. How different is the conduct of wise and well informed physicians. Enlightened by a numerous series of observations, and by reading the great masters of the art, they examine attentively the phenomena of the disease which is the object of their research; they compare its progress and nature with all such as take place spontaneously at such and such a season; they take into consideration the age of the patients, their constitution, the climate they inhabit, the affections to which they are subject, the passions by which they are most frequently agitated. To these scrupulous inquiries they unite the regular inspection of all the organs; they describe with precision the alterations in their form, colour, texture; they collect the contents of the digestive canal, study carefully their physical properties; decide on their nature, by making numerous chemical experiments, and thus, supported by pathological anatomy, physiology, and chemistry, they arrive at rigorous conclusions, proper for bringing truth into broad day-light, and which alone are capa-

ble of serving as a basis on which the magistrates ought to pronounce their judgment.

1025. These considerations are sufficient to manifest the interest excited by the article on which we are now about to treat; so we shall endeavour to fathom it as far as in our power.

1026. The spontaneous diseases capable of being confounded with acute poisoning, are, *indigestion, cholera morbus, vomiting of black matter, black flux, putrid fever,* &c.

Indigestion, or diseases which take place shortly after having eaten or drank certain substances which are not generally regarded as poisonous. It frequently happens, that persons in very good health experience, a few hours after the meal, an irritation in the stomach and small intestines, gripings, nauseas, vomitings of matter of different colours, but which is sometimes greenish, and spasmodic constrictions. These phenomena are observed more especially in persons that are weak, and subject to pains of the stomach. *Schenkius, Zacchias, M. Fodéré,* and many authors, have observed grievous symptoms produced by indigestion; but the following fact ought to appear here, of which *Professor Chaussier* has given the details in a medico-legal consultation in favour of *Dominique François,* who was accused of being the author of a case of poisoning. (Vide p. 60.) The celebrated *Darcet,* father of the learned chemist of the same name, when arrived at the age of seventy-six, preserved all his faculties, and enjoyed good health; only for some little time since he felt at times, though rarely, flying pains in the stomach. On the 11th of February, 1801, he went to dine with one of his friends, M. B . . . : he spent, as usual, a part of the evening there, and was even more cheerful than usual. Returning home about eleven at night, he went to bed, and slept quietly; but, about four in the morning, he felt suddenly a violent pain in the stomach, which continued with a greater or less degree of intensity. Notwithstanding the employment of the different means which were

had recourse to, the patient was lying on the side, bent forwards, the limbs bent, and brought close to the trunk; his countenance was pale, the eye dejected, and yellowish; the pulse frequent, and tight; thirst excessive, the extremities cold, the hypochondria tense; there was an alvine evacuation, copious, and extremely fetid, which appeared to relieve him for a moment; at last, in an effort of expectoration, the throat filled up with a viscid serosity of a brownish colour, part of which flowed from the mouth, and he died, twenty hours after the invasion of the pain.

On opening the body, there was found in the abdomen a certain quantity of fluid effused, which proceeded evidently from the draughts which the patient had taken, and there was found in the stomach, near its great curvature, a round hole, the size of a lentil, surrounded by some other smaller ones. On examining the interior of this viscus, it was seen, at the place of the perforation, that the membranes which form the coats of the stomach, were destroyed for the space of about two *centimetres*, in such a manner that there remained only that which formed the external coat of this organ. There was found also, a little further on, a similar erosion of the internal membranes, and one or two of these erosions were circumscribed by a small whitish cushion, rounded, and slightly projecting."

M. Alexander Gérard says, that a young man between twenty and thirty years of age, who had taken nothing in the morning but a glass of wine and water and a few ounces of bread, experienced, all on a sudden, about four o'clock in the afternoon, so sharp a pain in the region of the stomach, that he was obliged to stop and bend down the body, squeezing the belly with his arms. All the medicines given were of no use, the patient died twelve hours after the invasion of the pain, and on opening the abdomen, there was found, in the small curvature of the stomach, about an inch from the pylorus, a hole about a line and half in diameter, as round as if it had

been made with a centre-bit; and this hole, which was surrounded by a red circle of the breadth of a quarter of a line at most, had allowed a passage into the abdomen of the different fluids which had been given to the patient. (*Mémoire sur les Perforations de l'Estomac,* par M. Alexandre Gérard, 1803.)

1027. We could relate a very great number more of cases of the same nature; but shall confine ourselves to speak of what has been well established, by the observations of *Bonetus, Morgagni, Lieutand, W. Hunter, Lecat, Chaussier,* &c., that these eschars and perforations are capable of forming all at once, and of producing death in the course of a few hours, and that they may depend only on an internal cause.

1028. We have frequently confirmed a fact announced by *Hunter,* and which has some connexion with the object of this article; viz. that animals that have been caused to die of hunger, present, after death, a greater or less number of small ulcers in the stomach.*

* Some practitioners are of opinion, that in this sort of affections, the bile is decomposed, and acquires caustic properties. Without declaring in favour of this opinion, we can vouch for having made at various times a chemical analysis of the bile contained in the gall-bladder of persons that have died of severe bilious fevers, to which some physicians have lately given the name of *entero-mesenteric fevers;* we have constantly ascertained, that this fluid contained a greater quantity of resin than in its natural state; and that this had an acrid taste, pungent, and very hot; and it appears difficult to admit that such a fluid could remain in contact with our organs without inflaming or corroding them: for this reason also we are not far from reckoning it for something considerable, as a cause of the ulcerations and other lesions which frequently accompany these diseases.

Morgagni relates, that a child died of tertian fever, which, after extenuating him, brought him to the grave in the midst of terrible convulsions. His stomach contained a great quantity of green bile, which tinged the scalpel of a violet colour. The point of the scalpel, dipped in this fluid, became so venomous, that, two pigeons, wounded with this instrument, experienced violent convulsions, and died almost instantly. This bile was afterwards mixed with some bread, and some of it was given to a cock, which died

The Cholera Morbus. It sometimes happens, that persons of a bilious temperament, experience all at once a series of symptoms more or less serious, which may terminate in death, and which distinguish the disease we are now considering; these symptoms are vomitings of a various nature almost continual, in general bilious, of a green colour, or blue, or like lees of wine; dreadful pains of the abdomen, which particularly have their seat in the right hypochondrium, or in the epigastric region, accompanied often with a retraction of the abdomen; stools also bilious and copious; acid eructations, continual singultus, convulsions, vertigoes, delirium, cramps in the limbs, and particularly in the course of the tendons; the features of the face become decomposed, and there is a general prostration of strength; the pulse, which is small and accelerated, is sometimes imperceptible; the perspiration is suppressed, and cold sweats come on; the inside burns with heat, and the extremities are cold; the urine is turbid and rare. After death, it is observed, that the gall-bladder and *ductus choledocus* are distended; sometimes indeed, they are entirely empty; the duodenum and pylorus are frequently in a state of gangrene; the veins of the stomach are turgid; this viscus and the liver are in some cases inflamed; but the inflammation or gangrene never extends throughout the whole of the digestive canal; the bronchia are never inflamed.

The *Cholera Morbus* of which we are here speaking, is that which attacks a person suddenly, which consequently has no remarkable precursive sign; it may be excited by the ingestion of acid and cold drinks when the body is in a perspiration; by the sudden transition from cold to heat, or from heat to cold; by a violent paroxysm of rage; by the suppression of the menstrual discharge; by the repercussion of cutaneous diseases; by worms, and by a great quantity of food of difficult digestion. In general, it only takes place in the hottest months;

almost in as short a time as the pigeons had done, with the same symptoms, together with a trembling over the whole body.

however, a very small proportion of cases has been seen during cold winters.

Its progress is in general rapid; frequently the disease terminates at the end of a few hours; nevertheless, it has been known to last several days.

The termination takes place either by a speedy return to health, or by intestinal gangrene and death.

Of black Vomiting, and black Flux. We shall not attempt to decide whether in the black Vomiting, the stomach be the only organ affected, whilst in the black Flux it is the intestinal tube. It appears to us also totally unnecessary to establish the differences between what is called at the present day *hæmatemesis, intestinal hæmorrhage, melæna;* it is sufficient for us to know that under certain circumstances, black vomitings are observed, together with other symptoms which a person might be liable to confound with poisoning. This affection is described by Hippocrates, thus:*

"The patient at first throws up at every instant, and by regurgitation, fluids in tolerably great quantity, which are bilious or mucous, or like to saliva; then with them comes the food, which is very frequently vomited; at length, the matter thrown up becomes brown, bloody, similar to dregs, or to thick wine, or that which is already become strongly soured. When these evacuations are black, and appear to contain blood, their smell is fetid; they burn the pharynx, set the teeth on edge, and effervesce when they touch the ground. An uneasiness is felt after the vomiting, sometimes even before it takes place;† in some cases the patient feels himself somewhat relieved after vomiting; nevertheless, the stomach can neither remain empty nor full. In a state of emptiness, there are *borborygmi* and sour eructations; after the introduction of food, there is a sense of heaviness in the organs of digestion, a lancinating

* Hipp. de Morbis, lib. ii. in fine.

† Debility, lipothymia, and anguish, are symptoms which most constantly accompany vomitings.

pain in the breast, back, and side. The more this disease advances, the more formidable it becomes; the body becomes lean, the *conjunctiva* puts on a greenish tinge; the skin assumes a pale yellow colour, becomes soft and flaccid: at length slight shiverings take place, and a small degree of fever, pains of the head, weakness of sight, heaviness of the legs, the skin is livid, and destruction continues constantly to advance. In spite of the employment of proper remedies, this affection is fatal, and carries off the patients in a short time."

M. Portal, who has published, in the *Mémoires de la Société Médicale d'Emulation*, some observations on the *melæna*, reports two cases occasioned by strong affections of the mind; another, which was the consequence of the impression of the gout upon the organs through which the *vena porta* distributes its ramifications, &c. &c.

It is evident, from what we have just said, that this affection cannot be confounded except with the poisoning produced by corrosive and acrid substances (the others hardly ever producing bloody vomitings): now, when bloody vomitings or stools are occasioned by the corrosive poisons, the blood thrown up is of a fine red colour, whilst in this case it is black; beside that, corrosive poisons for the most part produce a severe inflammation in the mouth, œsophagus, stomach, and the rest of the intestinal canal; whilst in the melæna, the intestinal canal is not affected generally: there is seen only an excoriation, a *phlogosis*, or an eschar, in one or other part of the alimentary tube. In general, it is seen, that on squeezing the mucous membrane of the stomach of persons that have died of this affection, a black matter similar to that vomited is made to ooze out; a circumstance which never occurs in cases of poisoning by corrosive or acrid poisons. Moreover, the melæna is frequently occasioned by a scirrhus of the stomach, or of some other part of the abdominal viscera.

We might say still more concerning certain *vomitings*, as *bilious*, *mucous*, &c. which are sometimes observed in hysteri-

cal women, in certain cases of nipping *(pincement)* of the intestines, and in some other cases; these vomitings are accompanied with other symptoms more or less severe, the whole assemblage of which might be confounded with poisoning, if due regard were not paid to the antecedent circumstances, to the history of the case, &c. We shall confine ourselves simply to mentioning this fact, in order to fix the attention of juridical physicians.

Malignant (ataxique) fever. If we reflect ever so little on the manner in which many poisons act on the nervous system, we shall be convinced that their effects imitate sometimes those which characterize the malignant fever, and consequently, that it is necessary to be extremely circumspect, if the poison has not been discovered, not to confound these two affections. This case is so much the more intricate, since the opening of the bodies, far from affording any light, may, under certain circumstances, increase the uncertainty of the practitioner called on to decide.

1029. After having pointed out the principal diseases which may be confounded with poisoning, we think we ought to lay down the precepts which the juridical physician ought to have at hand, in order to avoid mistakes which might prove fatal.

1st. He will pay attention to the season of the year, and to the prevailing diseases; for the *cholera morbus* for instance prevails commonly in the summer months, which are nearest to autumn, and during the autumn itself: so likewise there exists such a kind of medical constitution in which colics and vomitings become as it were epidemic.

2nd. He will study well the habits and former way of life of the patient; he will especially inform himself whether he was a valetudinarian, whether he had experienced some disease ill determined, or whether he might not have some concealed vice (a thing which frequently enough happens) it being less probable that a man, who in other respects enjoyed good health, should be all at once attacked with violent symptoms

from an internal cause, or at least, that he should die of it; nature alone, or assisted by art, generally getting the upper hand, when the subject is healthy and strong.

3rd. He will observe, whether the disease be with or without fever, for it rarely happens that symptoms occasioned by an internal cause are exempt from it, whilst that is very common in cases of poisoning, at least in the early stages of their action.*

1030. If the diseases we have just described, exhibit numerous relations with those produced by certain poisons, the same thing cannot be said of a multitude of others which careless observers have sought to confound with poisoning, and which are principally polypi, aneurisms, internal abscesses, congestions of blood in one of the principal viscera, *angina pectoris*, internal hæmorrhages, the rupture of certain organs, &c. It sometimes happens in these affections that death takes place suddenly. The physician who may be called in to decide on the true cause of an accident of this nature, will easily prove that it does not depend on the action of a poison, 1st, because death in these instances is never preceded by the symptoms to which poisonous substances give rise; 2nd, because on opening the dead bodies, he will discover serious lesions produced by the diseases we have just enumerated, lesions which never result from the action of a poison. In truth, no particular lesion would be discovered in the case where sudden death might have been occasioned by some strong passion, such as an excess of grief, or an excess of pleasure; but, in this case, the history of the case, and the absence of the symptoms which characterize poisoning would be sufficient to enlighten the juridical physician.

* Fodéré, op. citat. tom. iv. p. 297.

ARTICLE II.

Of the means by the assistance of which we may attain to the knowledge of the nature of the substance which has occasioned the Poisoning.

1031. In examining each of the poisons in particular, we have adhered to the task of making known their physical and chemical properties, in order that the practitioner might be able to distinguish them one from the other, the progress which mineral chemistry has made within these five and twenty years, has permitted us to trace the medico-legal history of mineral poisons with a degree of exactness, which would be sought in vain in those of the organic kingdom ; this branch of chemical science is yet in its cradle, notwithstanding the important labours of modern chemists. The major part of vegetable substances cannot be distinguished from one another but by the physical characters they possess : when submitted to analysis they have furnished almost constantly similar products, so that, in the present state of knowledge, the idea of establishing between them any differences by means of chemical tests must be given up. It is from these considerations, that, in the particular history of vegetable poisons, we have confined ourselves to the description of the botanical characters of the plants and those of the poisonous products they furnish. But if it were useful to point out in each particular description which we have given, the distinctive characters of each poison, it is still more important to lay down the precepts which ought to direct the juridical physician who may be called in to cases of poisoning. In fact, he may often arrive when no information is to be had on the nature of the deleterious substance, either because the patient is not in a situation to give any account of it, or because the assistants are completely ignorant of the circumstances of the case : would not the practitioner

expose himself to the risk of losing the fruits of his inquiries, if, in the examination of the suspected matters, he did not follow some methodical plan, more especially being obliged to make his choice out of so great a number of poisonous substances? How, for instance, could he possibly form a correct judgment, if he be obliged to proceed by means of multiplied blind attempts, at the analysis of a very small quantity of the suspected substance? Would not experiments blindly instituted, cause him to commit serious blunders, or at least would they not leave him in a state of perplexity likely to bring ruin on his reputation, and leave the question undecided? These considerations lead us to give to this article all the extent which it appears to deserve.

FIRST PROBLEM.

To ascertain the nature of the poisonous substance with which any one has been poisoned, when the whole of it has not been swallowed, and the remainder can be procured.

1032. The resolution of this problem may be effected by the assistance of three different orders of means; 1st. Those resulting from chemistry, and which constitute analysis; 2nd. Those belonging to pathology, and which have for their object the *symptoms;* 3rd. Those under the head of pathological anatomy, and which are capable of making known the healthy or morbid state of the organs.

§ I. *CHEMICAL ANALYSIS.*

1033. Amongst the great number of poisons of which we have treated, there are some which may present themselves in a solid form, others in a fluid form; lastly, some of them are in a state of gas.

SOLID POISONS.

1034. We should begin by inquiring whether the poison belongs to the organic or inorganic kingdom: to this end, a very small quantity should be placed upon a plate of iron, heated to an obscure redness. All those belonging to the organic kingdom will be decomposed, they will diffuse a smoke, the smell of which will be similar to that of sugar-candy, of vinegar, or to that of burning horn; and in general they will leave behind a residue of the nature of charcoal, more or less abundant: some amongst them, which are composed both of vegetable and mineral substances, such as the acetates of lead and copper, emetic tartar, &c., will give also, as the result of this operation, the metals or oxydes which enter into their composition. The inorganic poisons, when placed on a plate of iron heated to an obscure redness, will exhibit phenomena which are variable: some of them will be volatilized, will diffuse a pungent vapour, the smell of which will never be similar to those we have just been speaking of; others puff up; in fine, the greater part of them will undergo no alteration, nor will they, under any circumstances, leave behind a residue of the nature of charcoal.

If it has been ascertained, that the solid poison belongs to the organic kingdom, we must next endeavour to ascertain, by its physical properties, whether its nature be vegetable or animal. It may be asserted in a general way, that those substances which diffuse a smell of sugar-candy when decomposed by fire, are vegetable substances; but it cannot be affirmed, that those which, placed under some circumstances, exhale an infectious smell of horn, are animal substances; for there are found in the vegetable kingdom, a certain number of substances which might be called *animalized*, which contain a great quantity of azote, and which give out a similar smell, whilst undergoing decomposition.

1035. If the organic substance on which this first experiment has been made, exhales an odour of sugar-candy, and it be in the form of a powder, or crystals of a white or bluish colour, we must endeavour to discover, whether it be emetic tartar, oxalic acid, tartaric acid, acetate of lead, acetate of copper, or verdigris; these are, amongst the poisonous vegetable substances that can be well distinguished by chemical tests, those which are the most commonly found in commerce. To this end, a small quantity of it must be dissolved in distilled water, and some sulphuric acid poured into the solution.

This Acid precipitates.	*This Acid does not precipitate.*
Emetic Tartar.	Oxalic Acid.
Acetate of Lead.	Tartaric Acid.
	The solutions of Acetate of Copper, and of Verdigris.

1036. Should the sulphuric acid have produced a precipitate, a soluble hydro-sulphate *(hydro-sulphuret)* should be poured into another portion of the solution: the emetic tartar will be precipitated of a reddish orange colour +, the acetate of lead of a black +.*

In the case where the sulphuric acid should not furnish any precipitate, a few drops of ammonia should be poured into the fluid, which would precipitate the solution of copper, and impart to it a tinge of blue +; whilst nothing of the kind would be produced in solutions of the tartaric and oxalic acids.

The oxalic acid may be distinguished from the tartaric, by the following characters:

* We employ the sign + to designate that the poison is recognized, and consequently that it will not be brought again into the list. Suppose then, that a black precipitate has been obtained by the hydro-sulphate, which indicates a salt of lead, it will then be necessary to employ the remainder of the solution in order to confirm, by means of the re-agents pointed out, Vol. ii. part 1st, Article *Lead*, that it is in reality a salt of this metal: the juridical physician would be very blameable, and might be led into error if he neglected to make these ultimate experiments.

1st. It leaves very little charcoal when exposed upon a plate of metal, of an obscure red heat; the tartaric acid on the contrary, leaves a great deal.

2nd. The oxalic acid decomposes the solution of sulphate of lime, with which it gives a white precipitate; the tartaric acid does not disturb this salt.

SOLID INORGANIC SUBSTANCES.

1037. When by this method it has been ascertained that the solid substance belongs to the inorganic kingdom, a certain quantity of it is to be taken, and to be dissolved in *distilled water*, which should be made to boil for a quarter of an hour, should the solution not have been effected by the cold water.

The portion to be dissolved should always be in proportion to the disposable quantity; but, in the general way, the half should be acted upon, for it is with the solution that the characters proper for recognizing the poison are obtained. It is needless to state that the quantity of distilled water varies also according to that of the substance to be operated upon, its solubility, &c.; but, in general, as little as possible of this fluid should be employed, in order to have the solutions more concentrated.

Substances soluble in Water wholly or in part.

1. Corrosive Sublimate.
2. Arsenious Acid (white Oxyde of Arsenic).
3. Muriate of Antimony.
4. Sulphate, Muriate, and Nitrate of Copper.
5. Muriate of Tin.
6. Sulphate of Zinc.
7. Nitrate of Silver crystallyzed, and Lunar Caustic.
8. Muriate of Gold.

Substances insoluble.

1. Red Precipitate or Oxyde of Mercury.
2. Black Oxyde of Mercury.
3. Turbith Mineral, or Sub-deuto-sulphate of Mercury.
4. Red and yellow Sulphurets of Arsenic.
5. Peroxyde of Antimony.
6. Kermes, Golden Sulphur.
7. Peroxyde of Tin.
8. Oxyde of Zinc.

Soluble Substances.	*Insoluble Substances.*
9. Nitrate of Bismuth.	9. Sub-Nitrate of Bismuth *(blanc de furd.)*
10. Potash, Sub-carbonate of Potash.	10. Carbonate of Barytes.
11. Soda, Sub-carbonate of Soda.	11. Carbonate of Lead.
12. Sub-carbonate of Ammonia.	12. Cinnabar.
13. Barytes, Muriate and Nitrate of Barytes.	
14. Lime.	
15. Nitrate of Lead.	
16. Nitrate of Potash.	
17. Sulphate of Iron.	
18. Muriate of Ammonia.	
19. Sulphuret of Potash.*	

EXAMINATION OF THE SOLUBLE SUBSTANCES.

1038. After having determined that the substance is soluble, either wholly or in part, the fluid should be carefully filtered, and labelled to prevent it being confounded with the others: we will designate it by the name of the fluid *A*. A small quantity of it should be put into an experiment-glass, and a few drops of hydro-sulphate of potash, soda, or ammonia (hydro-sulphurets) should be poured into it: this re-agent will form precipitates in some of these solutions.

Solutions which are precipitated by the Hydro-sulphates.	*Solutions which are not precipitated by the Hydro-sulphates.*
Corrosive Sublimate, black.	Arsenious Acid.
Muriate of Antimony, orange or red.	Potash, Sub-carbonate of Potash.

* Amongst these substances soluble in distilled water, there is only the muriate of antimony, a variety of the muriate of tin, and the nitrate of bismuth, that are not wholly soluble; the rest dissolve in it extremely well, unless they be very impure. In truth, the arsenious acid is but little soluble, and requires a greater quantity of fluid than the rest, and an ebullition kept up a much longer time. It is unnecessary to observe here, that we have included in this table, only the solid poisonous substances which are most common.

Solutions which are precipitated by the Hydro-sulphates.	*Solutions which are not precipitated by the Hydro-sulphates.*
Soluble Salts of Copper, black.	Soda, Sub-carbonate of Soda.
Muriate of Tin . { black or chocolate or yellow.	Sub-carbonate of Ammonia.
Sulphate of Zinc . { yellowish white, or deep brown.	Barytes, Muriate and Nitrate of Barytes.
Nitrate of Silver and Lunar Caustic { blackish brown.	Lime.
Muriate of Gold, deep chocolate.	Nitrate of Potash.
Nitrate of Bismuth, black.	Muriate of Ammonia.
Sulphate of Iron, blackish-green.	Sulphuret of Potash.
Nitrate of Lead, black.	

1039. Having ascertained that the solution is precipitated by the hydro-sulphates, the precipitate should be ticketed, and its colour noted: then a fresh quantity of the fluid *A* (§ 1038) is to be poured into another glass, and caustic alkoholized potash, dissolved in distilled water, added to it.

Solutions which yield a white Precipitate with Caustic Potash.	*Solutions which yield with Potash coloured Precipitates, or are not precipitated at all at the ordinary temperature.*
Muriate of Antimony.	Corrosive Sublimate, canary yellow+.
Muriate of Tin.	Salts of Copper, blue+.
Sulphate of Zinc.	Nitrate of Silver, deep brown+.
Nitrate of Bismuth.	Muriate of Gold: no precipitate cold+.
Nitrate of Lead.	Sulphate of Iron, green or red+.

1040. Amongst the solutions which give a white precipitate to the alkoholized potash, there is one which is capable of being decomposed by the muriatic acid *(hydro-chloric)*: a little of the solution *A* then (§ 1038) should be poured into another glass, and a small quantity of this acid added to it.

Solutions which precipitate by the Hydro-chloric (Muriatic) Acid.	*Solutions which do not precipitate.*
Nitrate of Lead+.	Muriate of Antimony.
	Muriate of Tin.
	Sulphate of Zinc.
	Nitrate of Bismuth.

1041. The solutions that do not precipitate with the hydro-chloric acid, should be treated with distilled water: to this end, another glass should be taken containing a little of the fluid *A* (§ 1038), and a tolerably large quantity of distilled water should be added to it.

Solutions which give a White Precipitate with distilled water, or become milky.	*Solutions which undergo no alteration.*
Muriate of Antimony+.	Muriate of Tin.
Nitrate of Bismuth+.	Sulphate of Zinc.

1042. Amongst the solutions that are precipitated, that which has already furnished with the hydro-sulphates (§ 1038) a black precipitate, is the salt of bismuth+; that which had precipitated of a yellowish orange, is the muriate of antimony+.

1043. If the solution has not been altered by the water, the oxyde should be separated from it by potash; it should be washed and heated with the nitric acid: if the oxyde dissolves in this acid, it may be concluded that it did not belong to a salt of tin+; if it dissolves there, every thing leads to the conclusion that it formed part of a salt of zinc+: to be sure of it, the poison should be examined as has been directed, Vol. 1. Part 2nd Art. *Sulphate of Zinc.*

1044. If we now return to the solutions that have not furnished any precipitates with the hydro-sulphates (§ 1038), we see that there are some which turn the syrup of violets green; which will be ascertained by taking a fresh quantity of the fluid *A*.

Solutions which turn the Syrup of Violets green.	*Solutions which do not.*
Potash, Sub-carbonate of Potash.	Arsenious Acid.
Soda, Sub-carbonate of Soda.	Muriate and Nitrate of Barytes.
Sub-carbonate of Ammonia.	Nitrate of Potash.
Barytes.	Muriate of Ammonia.*
Lime.	

1045. Among the solutions which have turned the syrup of violets green, there is the sub-carbonate of ammonia, which may be instantly eliminated, because it diffuses a pungent odour of volatile alkali; the others will be divided into two sections by the *solutum* of sub-carbonate of potash, which precipitates two of them.

Solutions which precipitate by the Sub-carbonate of Potash.	*Solutions which do not precipitate by this Re-agent.*
Barytes.	Potash, Sub-carbonate.
Lime.	Soda, Sub-carbonate.

1046. If the solution has been precipitated by the sub-carbonate of potash, a fresh quantity of the fluid *A* should be taken, and sulphuric acid poured into it.

The barytes will be precipitated +. The lime will not +.

1047. If the sub-carbonate of potash has produced no precipitate, some muriate of platina should be poured into a fresh quantity of the fluid *A*, which will precipitate of a canary-yellow, the potash and sub-carbonate of potash +, and which will not precipitate the soda, nor the sub-carbonate of soda +.

1048. Supposing the solution has not turned the syrup of violets green, it should be treated with lime-water, or by hydro-sulphuric *(hydro-sulphurated)* water.

These Re-agents precipitate.	*These Re-agents do not precipitate.*
The Arsenious Acid, white and yellow +.	Muriate and Nitrate of Barytes.
	Nitrate of Potash.
	Muriate of Ammonia.

* We omit to speak of the *sulphuret of potash* dissolved, because it is easily known by the smell of rotten eggs which it diffuses.

1049. If the solution is not precipitated, some sub-carbonate of ammonia should be poured into another portion of the fluid *A*.

This Re-agent precipitates	*This Re-agent does not precipitate*
The soluble Salts of Barytes.	Nitrate of Potash. Muriate of Ammonia.

1050. In order to distinguish the nitrate of potash, from the muriate of ammonia, quick lime in powder should be added. The first of these salts will undergo no alteration +; the muriate of ammonia will be decomposed, and will disengage ammonia, easily recognizable by its smell +.

1051. Let us suppose now, that the poisonous substance is not dissolved in distilled water (§ 1037): regard must be had to its colour.

Solid poisonous substances insoluble of a white colour.	*Solid poisonous substances insoluble, coloured.*
Peroxyde of Antimony.	Red Precipitate, or red Oxyde of Mercury.
Peroxyde of Tin.	Black Oxyde of Mercury.
Oxyde of Zinc.	Turbith Mineral, yellow.
Sub-Nitrate of Bismuth.	Sulphurets of Arsenic, yellow or red.
Carbonate of Barytes.	Kermes, brown-red.
Carbonate of Lead.*	Golden Sulphur.
	Cinnabar.

1052. If the substance be white, a portion of it should be brought in contact with the pure nitric acid, which will dissolve a certain number of them.

* When these substances are pure, they are constantly of a white colour; it may however happen, that they are a little coloured by some metallic oxydes; but that would never be to such a degree as to confound them with those which we have denominated *coloured*, the colours of which are very decidedly marked.

Substances soluble in pure Nitric Acid.		*Substances insoluble in pure Nitric Acid.*
Oxyde of Zinc, Sub-Nitrate of Bismuth,	without effervescence.	Peroxyde of Tin. Peroxyde of Antimony.
Carbonate of Barytes, Carbonate of Lead,	with effervescence.	

1053. If the solution in nitric acid has been effected without effervescence, some distilled water should be poured into it: that of the nitrate of bismuth will be precipitated of a white colour +; that of the nitrate of zinc will undergo no alteration +. In the cases where it has been effected with effervescence, it should be placed in contact with pure ammonia: that of lead will furnish a white precipitate +; that of barytes will remain transparent +. Nevertheless, we again repeat it, the precepts we have given are only indications; it will be essentially necessary to ascertain whether these different fluids possess the other properties which we have described in giving their chemical history. (*Vide* vol. 1. Part 1st and 2nd.

1054. If the solid substance of a white colour should be insoluble in the nitric acid, it should be dissolved in the hydro-chloric (muriatic) acid: the peroxyde of tin would furnish a hydro-chlorate, which would not be precipitated by distilled water, whilst the solution of the peroxyde of antimony would yield with this fluid a white precipitate in very great abundance +.

1055. Let us suppose now, that the solid poisonous substance insoluble in water is coloured (§1051): it will be seen whether it be of a red colour.

Red substances.	*Substances of other colours.*
Red Oxyde of Mercury.	Black Oxyde of Mercury.
Cinnabar.	Turbith Mineral, yellow.
Red Sulphuret of Arsenic.	Yellow Sulphuret of Arsenic.
Kermes, brown-red.	Golden Sulphur.

1056. Amongst these red substances, there are two that do not dissolve in the hydro-chloric (muriatic) acid.

Red substances soluble in the Hydro-Chloric Acid.	*Red substances insoluble in this Acid.*
Red Oxyde of Mercury.	Cinnabar.
Kermes, brown-red.	Red Sulphuret of Arsenic.

1057. The red oxyde of mercury dissolves in it entirely without heat, and rapidly; the solution is not decomposed by distilled water+. The kermes on the contrary, does not dissolve rapidly but in part; there is disengaged a smell of rotten eggs, and the solution furnishes a precipitate with water, white, or of an orange colour, according as it has been effected+. (*Vide* vol. 1. Part 1st, page 188.) If it be required to distinguish the cinnabar from the red sulphuret of arsenic, or the two other red powders, the dried powder must be heated in a small glass tube, with the solid caustic potash; the cinnabar will give out mercurial globules+, and the sulphuret of arsenic, metallic arsenic+.

1058. If the substance be not of a red colour (§ 1055), and should be black, there would be strong reason to suspect that it is the black oxyde of mercury; in that case we may be assured of it by means of the hydro-chloric (muriatic) acid, which would not dissolve it, but would combine with it, and convert it into calomel of a whitish colour (muriate of mercury at minimum, sub-chloruret of mercury). But if it should be of a yellow or orange-yellow colour, it may possibly be turbith, golden sulphur, or yellow sulphuret of arsenic (orpiment); in that case, in heating it to redness in a small glass tube for a few minutes, the turbith would give out metallic mercury+; the others would not be decomposed; but, on treating them with the hydro-chloric (muriatic) acid, the sulphuret of arsenic would remain without dissolving, whilst with the golden sulphur, there would be formed muriate of antimony soluble and capable of being precipitated by water.

POISONS FLUID OR DISSOLVED.

1059. Here, as in the case of solid poisons, the first thing to be done is to decide whether the fluid poison belongs to the inorganic or organic kingdom. Amongst the poisons of the organic kingdom, there are hardly any other than vegetable substances about which we need make inquiry. Now, these substances are in general coloured, whilst the greatest part of the fluid inorganic poisons are of a white colour: the former are frequently odorous; the latter almost always inodorous: the taste of the former is acrid, bitter, or astringent; the inorganic poisons have a saline, acid, or styptic taste. Left to themselves, the fluid vegetable poisons become decomposed, corrupt, and diffuse an infectious smell; the others undergo no alteration: lastly, on evaporating vegetable fluids, they furnish a solid production which decomposes on a plate of metal heated to an obscure red, in the same manner as we have stated § 1034; which character prevents them from being confounded with those of the inorganic kingdom.

The number of poisons of the inorganic kingdom, which are capable of presenting themselves in a fluid form, is very considerable. In fact, there exists, independently of those we have stated as being soluble in water, several acids and certain other bodies that are commonly in the fluid state; nevertheless the solution of this part of the problem presents no difficulties, when the details we have just entered into are called to mind. We should begin by pouring two or three drops into an experiment glass, in order to determine whether the poison reddens *strongly* the tincture of tournesol, and is precipitated by ammonia.

Fluid Poisons which constantly redden or destroy the Tincture of Tournesol, and are not precipitated by Ammonia.

Acid Sulphuric.
—— Sulphureous.
—— Nitric.
—— Nitrous.
—— Hydro-chloric (Muriatic).
—— Phosphoric.
—— Fluoric.
Chlorine (Oxygenated Muriatic Gas).
Hydro-sulphuric Acid (Sulphurated Hydrogen).*

Fluid Poisons which do not redden the Infusion of Tournesol, or redden it slightly; but, in this case, are precipitated by Ammonia.

Corrosive Sublimate.
Arsenious Acid.
Muriate of Antimony.
Soluble Salts of Copper.
Muriate of Tin.
Sulphate of Zinc.
Nitrate of Silver.
Muriate of Gold.
Nitrate of Bismuth.
Potash, Soda, Sub-carbonate of these bases.
Sub-carbonate of Ammonia.
Barytes, soluble Salts of Barytes.
Lime.
Soluble Salts of Lead.
Nitrate of Potash.
Sulphate of Iron.
Sulphuret of Potash.

1060. We need only occupy ourselves about the fluid poisons, which redden or discolour the infusion of tournesol, and which are not precipitated by ammonia; for the others are precisely the same as those we have just been studying, § 1037. Three of these poisons may easily be eliminated, because they diffuse a smell generally known; these are, the sulphureous acid, the smell of which is like burning sulphur+; the hydro-sulphuric acid (sulphurated hydrogen), which disengages a disagreeable smell of rotten eggs+; lastly, chlorine, the smell of which is suffocating, and which, far from reddening the infusion of tournesol, destroys it, and turns it of a yellow colour+. As to the rest, they are to be treated with lime-water.

* We say nothing of Ammonia, it being very easily recognized by its smell.

Those which precipitate by Lime-Water.	*Those which do not precipitate by this re-agent.*
Phosphoric Acid, which does not corrode glass+.	Acid Sulphuric.
Fluoric Acid, which corrodes glass to that degree, that it must of necessity be kept in metallic vessels+.	—— Nitric.
	—— Nitrous.
	—— Hydro-Chloric (Muriatic).

1061. Amongst the fluid poisons which do not precipitate by lime-water, there are some, that are rapidly decomposed by metallic copper.

Those which are rapidly decomposed by Copper without heat.	*Those which are not without heat.*
Acid Nitric+.	Acid Sulphuric.
—— Nitrous+.	—— Muriatic.
There is an effervescence and disengagement of orange-yellow vapours.	

1062. It is unnecessary, for the juridical physician, to point out the distinction between nitric and nitrous acid; the sulphuric acid cannot either be confounded with the muriatic; for it precipitates abundantly of a white colour the water of barytes in the least possible state of concentration+, whilst the muriatic acid causes in it no precipitate when diluted+.

GASEOUS POISONS.

1063. If we should be called upon to determine the nature of a Gaseous Poison which had produced fatal effects, we must proceed according to the following precepts, supposing, what is not improbable, that the deleterious gas is one of the following: chlorine (oxygenated muriatic gas), nitrous gas, ammonia, hydro-sulphuric acid (sulphurated hydrogen), sulphureous acid, protoxyde of azote, azote, carbonic acid, oxyde of carbon.

1064. It should be examined whether it has any colour or not:

Coloured Gases.	*Colourless Gases.*
Chlorine, greenish-yellow+.	All the others above-named.
Nitrous Acid Gas, orange-yellow+.	

1065. We then pay attention to their smell.

Gases having a very strong smell.	*Gases inodorous, or very little odorous.*
Ammonia, smell of Volatile Alkali+.	Protoxyde of Azote.
Hydro-Sulphuric Acid, smell of rotten eggs+.	Azote.
Sulphureous Acid, smell of burning Sulphur+.	Carbonic Acid.
	Oxyde of Carbon.

1066. For the inodorous gases, or those having little smell, a bell should be filled with them, and a lighted taper introduced.

The protoxyde of azote would cause it to burn with great energy +.

Azote would extinguish it, and would not precipitate lime-water +.

The carbonic acid gas would likewise extinguish it, but would produce a white precipitate in lime-water +.

The oxyde of carbon would take fire, burn with a bluish white flame, and the residue of the combustion would precipitate lime-water +.

§ II. *Of the information to be drawn by the Juridical Physician from the Symptoms of the Patient.*

1067. We have often combated, in the course of this work, the opinion of those physicians that think they can recognize, by the examination of the symptoms, the nature of the poison ingested: the facts we have made use of to refute this assertion are so numerous and striking, that it appears to us unnecessary to dwell longer on this subject. Nevertheless,

we do not pretend that it is of no use to make an attentive examination into these symptoms; on the contrary, we are perfectly convinced that they may, under certain circumstances assist in determining to what class the poison under investigation belongs. It is clear, that if the six classes of poisons, which we have adopted, were well made, that is to say, if they present characters proper to distinguish them constantly from one another, and if each one contained substances, the action of which on the animal economy was nearly the same; it is evident, we assert, that one might, by the aid of these symptoms, refer a poison to the class to which it belongs; but these conditions in several instances are wanting, which proves that the classification is far from being perfect. Meanwhile, until this part of the science shall have made the progress which we have a right to expect from the able men who cultivate it, we shall lay down certain considerations which appear to us sufficiently important.

Phenomena which may cause a suspicion that the Poison belongs to the Class of Acrid or Corrosive Substances.

In general these poisons have an acrid, hot, burning taste; they produce a constriction in the throat, and an extraordinary dryness in the mouth and œsophagus; they produce violent vomitings of different kinds of matter, mixed sometimes with blood; pains of the abdomen, particularly in the epigastric region; frequent stools. These symptoms are in a short time followed by such as characterize inflammation of the mucous and serous membranes of the stomach and intestines. In the general way, these poisons do not give rise to vertigoes, nor to paralysis of the abdominal limbs, unless they have been employed in a very strong dose, or the person be extremely susceptible; and, when these symptoms do take place, it is in the beginning of the disease. In general, the patient preserves the use of his intellectual faculties during the first periods; but, a short time before death, he falls into a state of great in-

sensibility and immobility, and is agitated by convulsive movements.*

Phenomena which might excite a suspicion that the Poison ingested belongs to the Class of Narcotics.

The poisons of this class have no caustic taste; their action on the mouth and œsophagus is different to that we have just described; they produce no pains shortly after their ingestion; they rarely occasion vomitings, and when these do take place, they are less obstinate than those produced by the corrosive and acrid poisons; the stools are also more rare; but they frequently give rise, shortly after their ingestion, to *vertigoes*, and *paralysis of the inferior extremities:* there exists a great propensity to sleep, stupor, coma, and the intellectual faculties are perverted, the pupils dilated; in general, the limbs are agitated with slight convulsive movements; sometimes, however, these movements are strong, especially towards the end of the disease, then there is acute pain.

Phenomena which may excite a suspicion that the Poison ingested belongs to the Class of Narcotico-Acrids.

In this class there are some substances that present nearly the same symptoms as the narcotic poisons, except that they are preceded by a slight degree of excitement; but there are a very great number, such for instance as Camphor, *Cocculus Indicus, Nux Vomica,* the different species of *Strychnos,* the *Angustura Pseudo-Ferruginea,* that have an intolerable bitter taste, and which, a short time after their ingestion, give rise to horrible convulsive movements; the limbs become excessively stiff; they are agitated in every direction; the person

* The quantity of the poison swallowed has a great influence on the nature and intensity of the symptoms. Thus, for example, three animals, which shall have taken different doses of corrosive sublimate, will present, before dying, symptoms very widely different; so that we should be very much embarrassed to determine any thing with precision on this head.

falls down, his breathing is suspended through the immobility of the thorax; the eyes are starting out of their sockets; the tongue, gums, and mouth, exhibit all the signs of asphyxia. These phenomena continue two, three, or five minutes, then the patient appears almost in the natural state; he is able to walk about for some time, until he falls under the influence of a fresh attack. This circumstance never happens in cases of poisoning by the Narcotics. In fact, the substances of this class produce no paroxysms, the symptoms continue till death.

§ III. *Of the information to be drawn by the Juridical Physician from the State of the Organs after the Death of Persons poisoned.*

1068. Before describing the alterations of texture produced by the different classes of poisons, we shall lay down the precepts which ought to serve for a guide in the opening of dead bodies. These precepts are extracted from the learned lectures of *Professor Chaussier*. We will begin by the opening of the thorax.

Opening of the thorax and neck. A longitudinal incision is to be made, which extends from the superior part of the sternum, to the base of the *xiphoid* cartilage; then two others are made, one superior, transversal, which follows the direction of the clavicle, and terminates near its *acromian* extremity; the other inferior, which, from the base of the abdominal appendage of the sternum, follows the cartilaginous contour of the ribs, and terminates near the projecting extremity of the fourth false rib. All the fleshy parts must be detached, which are applied over the anterior surface of the thorax; the flaps are turned back on the ribs, and the ribs and sternum are sawed through, directing the instrument from below, upwards, and in the direction of a line, which would extend obliquely from the extremity of the fourth false rib, to the superior part of the sternum, a little below the clavicles, taking care not to force the saw too deep, to avoid wounding any of the larger veins.

All the ribs must be successively cut through, except the first and the two last; the sternum is to be raised up; it should be turned down from the upper part upon the abdomen, and kept in that situation. The pleura and lungs are to be inspected; these last must be taken out by introducing the hand into the cavity of the thorax, the edges of which are previously covered with the folds of a napkin, to prevent excoriating the fingers; the œsophagus and aorta enveloped by the dorsal portion of the mediastinum, should be carefully considered; lastly, the pericardium, the heart, auricles, ventricles, great vessels, and the blood. These different organs are to be opened, and it will be sometimes observed, that they are more or less red in their interior, and even in their exterior, a phenomenon which is particularly observed in certain species of sudden deaths, and in all those affections in which the blood remains fluid: it depends essentially on the kind of death, and on a particular alteration of the blood, or on the body not having been opened till a long time after death, and ought not to be regarded as a consequence or proof of inflammation.

If there be blood, or any other fluid effused into the thorax, it should be collected with a fine sponge, and expressed into some vessel.

In these kinds of researches we must beware of attributing the brownish colour exhibited by certain parts of the lungs to lesion from any kind of foreign body: it depends evidently on the situation in which the patient died, and especially on that in which he was when he grew completely cold. In fact, as the blood stagnates in the vessels of the portion of the lungs corresponding to that part on which the body lies, the colour of that part ought necessarily to be browner.

Opening of the mouth, larynx, and trachea. The head should be placed in such a manner, that the fore part of the neck be well on the stretch and elongated; a longitudinal incision should then be made in the direction of the symphysis, which should divide the thickness of the lower lip, and

extend to the top of the sternum; another should then be made to follow the contour of the base of the lower jaw: the skin should next be detached, and the platysmamyoides muscle, until we come to the lateral parts of the neck; the maxillary bone should be sawed through upon the symphysis, and all the parts adhering to its internal surface should be cut; the tongue and adjacent parts are to be depressed, and by that means the *isthmus faucium* is brought in view. The pillars of the *septum staphylinum* are to be cut on each side, and the whole extent of the pharynx is discovered; the incision must then be prolonged downwards, and on the sides, when the œsophagus is easily found, which can be followed upon the bodies of the dorsal vertebræ, provided that the thorax has been previously opened.

In order to examine the trachea, it will be necessary first to separate the thyroid (gland), clean away with a sponge the blood that may have been effused into the trachea, and to make, from below upwards, a longitudinal incision, which should be continued to the *os hyoides*, dividing the larynx. If the bronchia are to be examined, the remaining portion of the sternum must be removed, together with the subjacent veins; to accomplish which, a portion of the clavicle and of the first rib, on each side, is to be divided with a saw.

Opening of the abdomen. The incision which had terminated near the extremity of the fourth false rib, should be prolonged on each side, and directed to the *crista ilii*; from there it is to be continued, turning it a little above the groins, as far as the os pubis; the sternal segment of the thorax must be strongly raised up, and the portions of the diaphragm that are inserted into it, cut through, together with the whole thickness of the abdominal muscles, as well as the umbilical ligament of the liver: this great flap is then turned down upon the thighs: on the interior edge of the diaphragm an incision should be made from sixty to eighty *millimetres* in length, which should be directed obliquely to the left. The costal

edge of the liver must be raised up, in order to view its concave surface, the gall-bladder, and a portion of the stomach; this viscus must be depressed with the hand, and drawn towards the right side, in order to perceive a portion of the spleen: the gastro-colic omentum is to be raised up and divided, to see the pancreas and posterior surface of the stomach; this must be turned back on the side of the thorax, and the intestinal canal and mesentery are to be examined; this last must be divided longitudinally, in order to decide on the state of the vessels situated on the bodies of the lumbar vertebræ; lastly, there remain to be examined the *glandulæ supra-renales*, the kidneys, ureters, bladder, and internal and external organs of generation: after which, the digestive canal should be detached in the manner we have described, Vol. i. Part i. p. 72.

If the coats of the stomach or intestines shall have been perforated, it will be necessary to absorb with a sponge, which should be squeezed out into some vessel, the fluids contained in the abdomen; after which, ligatures should be passed above and below the perforations, then the whole intestinal mass should be removed.

These researches being finished, every part of the body should be replaced in their former situation; all the incisions should be sewed up with large stitches; the body should be washed and wiped, and enveloped in a large sheet, upon which the magistrate ought to fix his seal. The cavity from which the viscera have been taken, should never be filled with bran, ashes, or lime; no portion whatever of the body ought to be carried away, unless indeed from an indispensable necessity of making further researches; and, in that case, it ought to be intrusted to no one, and should be placed in a vessel well stopped, after being enveloped in linen. The poisonous substances ought to be divided into two parts: one is to be preserved in pure alkohol, the other to serve for making the experiments proper for determining its nature. These experiments ought to be made in the presence of the magistrate ap-

pointed to this office, who ought to shut up the portions destined for examination, and place a seal upon them in case it should be necessary to pursue the researches. It will be necessary to verify the integrity of the seal before going on with the experiments that are begun.*

1068. If now we cast a glance on the lesions of texture which the different poisons produce, we shall perceive that it is not always easy to establish from them constant characters sufficient for determining the class to which they belong.

LESIONS OF TEXTURE PRODUCED BY CORROSIVE OR ACRID POISONS.

In general these poisonous substances excite an inflammation which extends from the mouth to the duodenum, but which is more manifest in the stomach; not unfrequently the *intestinum rectum* is found also inflamed, though the other portions of the intestinal canal are in their natural state. In other cases the inflammation spreads through the whole extent of the digestive tube: this inflammation varies with respect to its intensity: sometimes the textures are of a clear red colour, without any trace of ulceration; sometimes of a cherry red, or of a deep red, with longitudinal or transversal patches of a blackish colour, formed by extravasated blood; and sometimes there are ulcerations and sloughs. But it has happened

* It sometimes happens that it is necessary to open the cranium, in order to ascertain the state of the cerebrum, cerebellum, and the meninges. In this case, after shaving off the hair, and raising up the pericranium, the *calvaria* is to be taken off. For this purpose the trepan is to be four times applied, twice in front, once on the right side, and once on the left, upon the edge of the frontal bone which articulates with the parietal; and twice behind, near the mastoidean angle of the parietal bone; after which, the cranium is to be sawed through, following a line which, from the middle of the *os frontis* and a little above the orbits, extends circularly round the cranium, passing upon the occipital bone, a little below the superior arches.

in certain cases, that the poisons of this class have produced death after having been swallowed, without occasioning the smallest lesion: such was the case with that young girl spoken of by *Etmuller*, who died after having taken arsenic. We have frequently observed the same phenomenon on giving to animals very strong doses of corrosive sublimate, which have destroyed life in a very short time.* *M. Marc* relates, that in a case of poisoning by arsenic, instead of finding any erosion of the membranes of the stomach, they were found to be thickened. Be it as it may, it will always be right, in the examination of the lesions of the texture of the digestive canal, to follow the precept given by *Baillou*, which consists in examining them scrupulously, by placing them between the eye and the light: in fact, by this means, the smallest holes have sometimes been discovered, which had escaped the simple inspection of the organ.

We have confounded under one title the lesions produced by the corrosive poisons, and those resulting from the action of the acrid substances, because we are persuaded that it is impossible to distinguish them.

We regard as nothing those distinctive characters given by juridical physicians, viz. 1st. The separation of the villous coat (mucous membrane) of the stomach from the muscular coat, which, according to them, takes place when a corrosive poison has been swallowed, and which does not exist when the person has taken an acrid one. In fact some of the poisons of both these classes produce this alteration, and frequently it is not produced by either of them. 2nd. The facility with which the inflammation developed by corrosive poisons extends to the neighbouring organs, and to the skin; whilst this phenomenon does not exist with acrid substances.

* We purposely omit to speak of the lesions of the other organs, because we feel persuaded that they are frequently the same as those produced by poisons of the other classes; perhaps we may here except the lungs, which appear to be more particularly affected by the narcotic poisons.

It is evident that when these last are extremely energetic, they ought to produce the same lesions, which circumstance moreover is frequently wanting, even in the corrosives.

LESIONS OF TEXTURE PRODUCED BY THE ASTRINGENT POISONS.

These poisons, which especially comprize the preparations of lead, produce the same lesions as the corrosives when ingested in great quantity. (*Vide* Vol. 1. Part 2nd, page 475.) If the poisoning has happened from *Saturnine Emanation*, then a contraction in the diameter of the intestines is observed.

LESIONS OF TEXTURE PRODUCED BY THE NARCOTIC POISONS.

We have never discovered the slightest trace of inflammation in the digestive canal of animals killed by the poisonous substances which we have arranged under the class of Narcotics; some authors, however, pretend the contrary. It is always true, that this case is extremely rare, and, in some instances, the inflammation may be the consequence of the irritating fluids administered for the purpose of causing vomiting, or opposing the effects of the Narcotic. But if the digestive canal be not the seat of any inflammation, the lungs present almost constantly livid, and even black spots; their texture is more dense and less crepitating. We are far, however, from giving this character as sufficient to distinguish the narcotic poisons; for it is frequently met with in poisoning by the narcotico-acrids, and even in poisoning by the corrosive and acrid substances.

Shall we notice, as certain juridical physicians, the alteration of the face, the state of the eyes, which are half open, the extraordinary distension of the stomach and intestines, &c.; characters which have been pointed out as sufficient to dis-

tinguish the poisoning by narcotic substances? These signs are common to a very great number of poisons of the other classes, and consequently are more likely to lead into error, than to enlighten. We are far also from admitting, that the bodies of persons who have died by the effects of a Narcotic, putrefy constantly in a very short time: that their limbs are flexible, and the blood fluid. How many times have we not observed, in opening these bodies, four and twenty, or six and thirty hours after death, that putrefaction was not more advanced than usual; that the limbs were as stiff as in such as had been poisoned by substances of another class; lastly, *that the blood was coagulated?* How in this case can the red, livid, and violet spots be formed, which appear on the surface of the skin, which have also been improperly given as a character of this kind of poisoning, and the formation of which has been attributed to the speedy putrefaction, and to the great fluidity of the blood, which was extravasated and oozed through the pores? ....

LESIONS OF TEXTURE PRODUCED BY THE NARCOTICO-ACRID POISONS.

The poisons of this class may be divided into two sections, with regard to the state in which the digestive canal is found after death; some of them produce inflammation, accompanied sometimes by ulceration: such are the *Belladonna, Stramonium,* the different species of *Hemlock, Alkohol,* &c.; the others do not inflame: of this number are the *Nux Vomica, the bean of St. Ignatius,* &c. This consideration may be of great use in distinguishing the poisons of this class of narcotics, more especially when combined with the information furnished by the symptoms. In fact, let us suppose, that after the ingestion of a poisonous substance, there should appear signs of excitement followed by vertigoes, paralysis of the inferior ex-

tremities, &c., and that after death, the digestive canal is found to be inflamed, it is to be presumed, that the poison ingested belongs to the Narcotico-acrids, because the Narcotics do not produce inflammation in this canal. The poison will moreover belong to the Narcotico-acrids, if the animals have been strongly excited, agitated by violent convulsive movements, with symptoms of asphyxia; if there have been lucid intervals, after which fresh paroxysms took place;* lastly, that no inflammation is discovered in the digestive canal. Guided by these observations, we have frequently determined in animals, to which of these two classes the poison belonged. Nevertheless, there are facts which prove, that in this class, as in that of the corrosives, the signs drawn from the lesions observed after death, are liable to lead into error. Thus, for instance, it is well known that the leaves of the *Nerium Oleander* inflame the texture of the stomach when they remain there several hours. *Morgagni* relates an observation in which the juice of these leaves produced death, and the digestive canal was not found inflamed. "A poor woman, sixty years of age, wearied of life, and who had already attempted to drown herself, swallowed a tolerably large quantity of the juice of the leaves of the *Nerium Oleander* in some wine. Three hours after, she had violent vomitings, syncopes, and lost her speech; the lips were black, the pulse small, feeble, tense; at length she died at the end of the ninth hour. The body was of a violet colour posteriorly, from head to foot; the anterior part was in its natural state; there was no meteorism; the abdomen and breast preserved a little heat, although seventeen hours had elapsed since death: the blood-vessels of the stomach, intestines, and omentum, were very much distended; the stomach contained a certain quantity of a greenish fluid; its membranes appeared sound; the posterior surface of the

* It may however happen, that the animals die at the end of the first attack, when the dose of the poison has been considerable.

right lung was red and adhering; the left lung was shrivelled; all the other viscera were in their natural state.*

1069. It results from all that we have said relative to lesions of texture;

1st. That the corrosive, acrid, astringent, and a part of the narcotico-acrid poisons, occasion almost always inflammation in one or more parts of the digestive canal, when swallowed in a sufficient dose; that the same thing does not take place with the narcotic, and a part of the narcotico-acrid poisons.

2nd. That it is nevertheless certainly proved, that, under certain circumstances, some of the corrosive and acrid poisons have produced death, without leaving the slightest trace of alteration in the digestive canal.

3rd. That the juridical physician called in to a case of poisoning, cannot deny its existence on that ground only, that the digestive canal exhibits no lesion, as the poisoning may have been produced by the narcotics, narcotico-acrids, &c.

4th. That in case a person, who has died suddenly of severe symptoms, should exhibit the digestive canal inflamed, corroded, ulcerated, &c., the introduction of some poison may be *suspected*, but cannot be *affirmed;* as we have asserted, that several severe spontaneous diseases might resemble poisoning during life, and the dead bodies would present lesions similar to those produced by the corrosive poisons.

5th. That in general, the lesions of the lungs, brain, heart, and other organs, may be the result of too great a number of causes, to make them serve as proofs of poisoning.

6th. That the juridical physician can only decide on the actual existence of poisoning, inasmuch as he may have proved in a manner incontestable, by chemical analysis, or by its physical properties, the existence of the poisonous substance itself.

7th. That in case he should suspect the poison to have been

* *Morgagni de Sedibus et Causis Morborum*, Epist. lix. No. 12.

in too small a quantity to be discovered; that there should exist serious lesions in the digestive canal, and that all appearances favoured the belief of the person having been poisoned, he ought to confine himself to declaring to the magistrate, that there are probabilities in favour of the poisoning, but that he cannot prove its existence.*

1070. We have just examined all that relates to the lesions of the dead bodies of persons poisoned; we have supposed that the opening of the body has taken place a few hours after death; but it may happen that we may be obliged to set about it fifteen, twenty, thirty, or forty days after their interment. In this case, they may be putrefied, and exhibit spots

* It is of great importance, in the examination of lesions of the digestive canal, not to confound the red or violet colour which appertains to inflammation, with that which depends sometimes on a peculiar kind of drink, or on some other cause. The following observation is calculated to throw a light on this subject.

" A private person of Châlons-sur-Marne, who was in a state of convalescence from a disease under which he had laboured, took a slight purgative, in consequence of which he died suddenly. He was believed to be poisoned by the effects of a *quid pro quo* of the apothecary, and in order to be assured of this, the body was opened. The œsophagus and stomach in fact were found to be red, and as it were livid, in certain places, that is to say, in a state of apparent gangrene. This was at first adhered to, and the patient was looked upon as evidently poisoned. However, *M. Varnier*, a physician of Châlons, who was not the same as had attended him during his illness, knowing the correctness and prudence of the apothecary who had prepared the purgative medicine, made farther reflections, and arrived at the proof that his death was the consequence of the disease, and that the apparent convalescence was only an insidious respite. But it was necessary to give some account of the state of the œsophagus and stomach; and having learned that the deceased was in the habit of using a strong infusion of red poppies, the idea struck him that the extraordinary colour of these organs might possibly depend on this infusion: in order to assure himself of it, he caused a dog to swallow, for some time, a similar infusion; afterwards, having opened the body, he discovered that the same parts of this animal had put on the same colour as had been observed in the deceased we are speaking of, and this violet red colour was so firmly fixed, that it resisted the action of many and repeated washings." (FODERE, *Médecine Légale.)*

of a violet colour, or black, or some other alterations which would not have been discovered if the opening had been effected a short time after death. In cases of this kind, the practitioner cannot be too circumspect, and he ought not to decide till after having paid attention to the sound or corrupt state of the body, to the season, variations of temperature, &c. &c.

SECOND PROBLEM.

To determine the nature of the Poisonous Substances with which any one has been poisoned, when it has not been swallowed entirely, and is mixed with Tea, Wine, or other alimentary substances.

1071. If at the bottom of the drink there be found any substance either in powder or crystals, the fluid should be decanted in order to separate them, and all the experiments we have described in § 1037, should be made on the solid portion. In fact, it may happen that a poison has been dissolved with heat in some drink, and has subsided on cooling, or that it has not been entirely dissolved without heat.

1072. In case the sediment should not prove poisonous, a portion of the fluid should be examined by the re-agents, in the manner we have described when speaking of poisons in solution, § 1060; and if, after making the suitable experiments, such precipitates should be obtained as are proper for recognising it, it may be concluded, that poisoning has taken place. But if the re-agents furnished precipitates different to those pointed out in the preceding problem, it would still be imprudent to conclude that the fluid in question is not poisonous. In fact, how many times have we not demonstrated that, *by their mixture with alimentary substances, poisons lose the power of furnishing with these re-agents precipitates similar to those which they exhibit when pure.*

Before drawing any conclusion, it will be necessary to introduce this fluid into a retort, to which a receiver is adapted; to heat slowly this retort until the liquor be reduced to half, to determine the nature of the volatilized portion,* and to examine, whether after cooling, there be not formed a sediment either in powder or crystals, which should be analyzed as above described.

If the fluid remained transparent, it should be put into a capsule, and evaporated to the consistence almost of a syrup, in order to obtain, under the form of a powder or of crystals, the solid poison that may chance to be found in solution: it should then be examined in the manner we have directed in the first problem. If, in spite of these different operations, it should prove impossible to obtain it under this form, it may be supposed, either that it has been decomposed, and converted into a kind of *magma*, or that it is of a vegetable nature.† Then a part of the product should be evaporated to dryness, and calcined in a small glass tube (described in Vol. 1st, Part 1st.) with pure potash and charcoal. If globules of mercury should be obtained, it may be concluded, that the poison is mercurial: it would be arsenical, if instead of globules, it should become volatile, in the form of brilliant plates like steel, possessing all the properties of metallic arsenic. In cases where this calcination throws no light upon the nature of the poison, the process should be begun over again, by putting the mixture into a small crucible, which must be kept at a red heat for some time. By this means a brilliant metallic substance would be obtained at the bottom, the nature of

* It may be conceived indeed, that there are a certain number of poisons which ought to pass into the receiver; such are ammonia and the sub-carbonate of ammonia, nitric acid, hydro-chloric (muriatic) and sulphureous acids.

† In fact, almost all the mineral poisons, which we have taken notice of in this work, are solid salts which, having been dissolved in any fluid whatever, ought to pass into the solid state by evaporation, at least unless they have been decomposed by the alimentary substance.

which should be determined by the process we are about to describe, after having enumerated the metals which might possibly be the object of these researches. These metals are, beside arsenic and mercury, which are supposed to be already eliminated, antimony, copper, tin, bismuth, zinc, silver, gold, lead. The metallic substance is to be treated by pure nitric acid, which should be heated; five of these metals will be dissolved by the acid; copper, zinc, bismuth, silver, and lead: two would be converted into a white oxyde; tin and antimony: gold would undergo no decided alteration.

Nitrates formed by the Metal and the Nitric Acid.		*Oxydes formed by the Metal and the Oxygen of the Nitric Acid.*
Nitrate of Copper, blue+.		Peroxyde of Antimony.
Nitrate of Zinc.	white.	Peroxyde of Tin.
Nitrate of Silver.		
Nitrate of Bismuth.		
Nitrate of Lead.		

The colourless nitrates will be easily distinguished; in fact, that of bismuth is the only one which gives a copious white precipitate with distilled water+; there is only that of lead which gives a white precipitate with the sulphuric acid *extremely diluted*+; that of silver gives, with lime-water, potash, or soda, an olive brown precipitate+; whilst that of zinc gives a white precipitate with all these alkalies+. As to the two oxydes of tin and antimony, they should be dissolved in the hydro-chloric (muriatic) acid, and the solutions should be treated by distilled water, and by the hydro-sulphates; the water would produce a white precipitate with the muriate of antimony+, and would not disturb that of tin; the hydro-sulphates would give a reddish orange precipitate with the salt of antimony, and yellow with the salt of tin.

1073. It is evident, that in the solution of this problem, the same conclusions might be drawn from the symptoms and lesions observed after death, as those we have already described in the preceding problem.

1074. The same steps ought to be pursued in the case where *the poison has been swallowed wholly, and nothing can be acted upon except the matter vomited, and what may be found in the digestive canal after death.* In this last case however, the analysis of the texture itself ought to be made, if all the researches on the solid and fluid aliments shall have proved fruitless.

ARTICLE III.

Of Experiments on Living Animals, considered as a means proper for ascertaining the existence of poisoning.

1075. It is a generally received opinion that, amongst the different means employed for deciding on the existence of poisoning, the causing dogs to swallow the fluid found in the stomach of persons who are supposed to have died from poison, deserves to be preferred before all others. If the animal die, it is said, or experience grievous symptoms, it is a proof that poisoning exists; whilst at the same time, no such thing has happened if no severe symptoms shall have taken place in the animal. This opinion has prevailed from time immemorial; it has been supported by men little versed in chemistry, who have avoided, under frivolous pretexts, compromising their reputation by seeking to analyze the fluids; it has also found partisans amongst enlightened physicians who have felt the impossibility they experienced of determining the nature of vegetable poisons, and who have consequently recommended the trial to be made, whether the matter contained in the stomach of a person supposed to have died by poison would occasion a speedy death to animals in good health.

On the other hand, some juridical physicians have raised their voices against such experiments, as being liable to lead the magistrates into error, and cause *them* to commit enormous blunders in *their* decisions. In fact, they say, supposing that

these experiments have been well made, might it not happen, that the person has been attacked by one of those spontaneous diseases in which the animal fluids become altered, contract a remarkable acrimony, acquire a poisonous property, and necessarily occasion the death of the dogs to which it may be given? Would it not be absurd, under these circumstances, to decide that the person had been poisoned? But how frequently they add, have the conclusions drawn from these kinds of experiments proved incorrect, because the experiments themselves had been badly made? Animals have been forced to swallow fluids by no means deleterious; nevertheless, these animals have expired a few minutes after, because the fluid had flowed through the larynx into the lungs; under other circumstances, extraordinary motions, resembling convulsions and extreme agitation, have immediately followed the ingestion of this kind of drink; phenomena which have been attributed to a poisonous substance, whilst they frequently depended on the efforts which had been made to retain these animals, on the rage into which they were thrown, or on some peculiar susceptibility. These considerations have induced us to undertake a few experiments on this subject, with the intention of determining the precise value of an experiment so generally accredited. The following are the results of our labour.

1st. In the case where the suspected substance at the disposal of the practitioner shall have been analyzed in a suitable manner, the remaining portion ought to be introduced into the stomach of a small robust dog, that is fasting; but the practitioner must take care not to make him swallow it, or put it into his food, as has been hitherto the practice. In fact, not only would he run the hazard of losing, by this proceeding, the greatest part, because the animal would reject it, but the food with which it is combined might exert upon it some chemical action, and decompose it to such a degree as to change entirely its nature. Beside, it would happen, at least six times

out of ten, that a part of it would flow through the larynx into the lungs, and the animal would die of asphyxia.

2nd. The best method that can be employed, consists in detaching the œsophagus, perforating it with a small hole, introducing into it a glass funnel, and pouring the liquid into the stomach: that being done, the œsophagus is to be tied below the opening. It would be imprudent to prefer to this method, the use of an elastic gum tube adapted to a syringe, for many animals bite the tube, pierce it with holes, and the fluid then flows out of the mouth; beside, syringes of tin might decompose certain poisonous fluids.

3rd. If the suspected substance, instead of being fluid, has a soft or solid form, and could not possibly be made to enter into the stomach by means of the funnel, we should begin by expressing it, in order to obtain the fluid part, which should be introduced in the manner we have described, and the solid portion should be put into a small paper cone, in order that it may be pushed down into the stomach, by an opening made in the œsophagus: the ligature of this canal should then be effected. This manner of operating presents immense advantages. In fact, it is the only method by which vomiting can be prevented; and how many poisonous substances are there not, of which the stomach would instantly unload itself after their ingestion, which, being thus retained, are capable of developing symptoms of poisoning, and even of producing death!

But, will it be said, the operation of the œsophagus constantly destroys life, and frequently enough produces alterations in the textures (*Vide* the Appendix); how then determine that death has been the result of the suspected substance, rather than of the operation? This objection has no foundation, for either the suspected substance is in quantity sufficient to destroy the animals, or it is not. In the first case, death will take place during the first forty-eight hours, and will be preceded by symptoms more or less severe, a

phenomenon never observed in the simple ligature of the œsophagus.*

If the substance should not be in sufficient abundance to produce death, the experiment will not be more conclusive, than if the œsophagus had not been tied. In fine, let us suppose a case the most unfavourable to our opinion, that in which this substance should produce variable symptoms, which should disappear at the end of two or three days : these symptoms, it may be said, would be attributed to the poison, if the œsophagus had not been tied, whilst, in the contrary case, one might be inclined to believe that they depended on the operation. To that we reply, that this operation of itself would not produce, during the first forty-eight hours, any other symptom than a slight dejection, and all other morbid phenomena that may be observed, ought to be attributed to the poisonous substance. Beside, would not the practitioner be to blame to decide on the existence of a poison, because the animal to whom he had given the suspected substance, had appeared incommoded for two or three days ? These sorts of experiments ought not to be esteemed valuable, except as they may furnish a well decided result ; that is to say, an acute disease followed by sudden death ; or when they furnish no decided symptom, and are moreover agreeable to the results obtained by chemical analysis when the poisonous substance belongs to the mineral kingdom. In doubtful cases, the practitioner ought always to endeavour to be favourable to the accused.

4th. If the suspected substance produced the death of

* There would only be the symptoms produced by the corrosive poisons, that might sometimes be confounded with the dejection produced by the operation of the œsophagus ; but the opening of the body would elucidate the matter ; for, in the case where the corrosive poison had produced death, within the first forty-eight hours, it would give rise to a very extensive inflammation of the membranes of the stomach (unless death should have happened very suddenly) ; a lesion, which cannot depend on the simple ligature of the œsophagus.

the animal, it will be necessary, before concluding on the existence of poison, to be well assured, that the person, in whose digestive canal it was found, has not died from one of those spontaneous affections which we have spoken of; for it might happen, in this case, that the animal fluids, and particularly the bile, had contracted deleterious qualities, capable of producing all the symptoms of poisoning.

5th. In the case where the animal should not experience any remarkable symptom from the substance, there will be no right to conclude, from this single experiment, that no poisoning has taken place. In fact, a multitude of causes might prevent the fluids contained in the digestive canal of a person, who had really died from the action of some poison, from being of a poisonous nature. 1st. The poisonous substance might have been decomposed in the stomach, by different kinds of food, or drinks, or by the animal texture. Thus, for instance, twelve grains of corrosive sublimate are swallowed by a man in good health; he experiences symptoms of poisoning, and dies; the body is opened four and twenty, six and thirty, or eight and forty hours after. A dog is made to swallow the contents of the digestive canal, and suffers no inconvenience from it. We have observed this phenomenon a great number of times. It would be extremely wrong to conclude, that the patient had not been poisoned. It is evident, that in this instance, the sublimate has been decomposed by the food, and even by the membranes of the stomach, converted into an insoluble matter, which exerts no hurtful action on the animal economy.

The same thing would happen, if verdigris had been taken before or after the ingestion of albumine, and of some other animal substances; the same may be said of muriate of tin, and of certain other poisons. 2nd. The poisonous substance may have been taken in a sufficiently strong dose, and rejected afterwards by vomiting, yet nevertheless produce death: the digestive canal, in this case, contains mucosities and bile,

which do not contain an atom of the poison ingested, and which, consequently, will produce no accident when given to dogs. 4th. It may happen, that the poisonous substance is of the number of those that are easily absorbed; that the patient has taken a dose sufficient to kill him; but that a very small quantity remains in the digestive canal; in that case, the negative result obtained by giving to dogs the contents of the digestive canal, would be more likely to mislead than to enlighten; so that we are of opinion, that experiments of this kind, separately considered, possess no value only as they present a positive result, that is to say, death; but, we repeat again, they ought not to be regarded, even when well made, but as a secondary means, proper for corroborating the conclusions drawn from chemical analysis, symptoms, and lesions of texture.

ARTICLE IV.

Of the means proper for distinguishing whether the Poison has been introduced into the Digestive Canal during Life, or after Death.

1076. Of all the crimes hitherto committed, there is none which inspires so much horror, as that which consists in introducing into the rectum of a dead body a poisonous substance of any kind, with the view of accusing an innocent person of having been the perpetrator of the poisoning, and so to compromise his honour and his life. Nothing can equal such an atrocity, and we were far from believing that it had ever been committed, until we were able to procure several proceedings of the Criminal Court of Stockholm, in which there is mention of a case of this kind. Medical jurisprudence embraces few cases of so high importance.

Let us suppose a person to be attacked all at once with a serious disease, which is spontaneous, who dies at the end of a

few hours, and into whose rectum is injected, a few moments after death, a corrosive solution. A report is circulated that he has been poisoned, and the magistrates order a practitioner to verify the fact. The latter proceeds to the opening of the body, recognises the existence of poison by chemical analysis; and discovers an inflammation more or less intense of the textures to which the poisonous substance has been applied. If he does not reflect that the poison possibly may have been introduced after death into the rectum, and is ignorant of the means of ascertaining this fact, he decides that the person has died from poison, and sacrifices an innocent victim to the vengeance of a vile assassin.

It has then appeared to us essential to undertake a labour to that effect, in order to be able to establish characters proper for distinguishing whether the poison has been introduced into the digestive canal before or after death. Our experiments have been made on the dead bodies of men and of dogs; we have multiplied and varied them; sometimes the poisonous substance has been introduced immediately after death, sometimes half an hour, an hour, two hours, or four and twenty hours after, in order to be able to establish the alteration which the textures undergo under these different circumstances. We have thought it useful to confine our experiments to corrosive substances; the narcotics and narcotico-acrids not producing any local lesion after death, or producing a very slight degree of it similar to the former.

EXPERIMENTS MADE WITH CORROSIVE SUBLIMATE.

Experiment 1st. A large shaggy dog was hung at three quarters past eight in the morning; five minutes after, a drachm of Corrosive Sublimate, in the form of powder and small fragments, was introduced into the rectum. The body was opened the next day at two in the afternoon. The great intestines

contained no excrementitious matter, but the rectum exhibited a remarkable alteration from the anus to about four fingers' breadth above; it was externally of a fine white colour; the serous coat was opaque, hard, and resembled, to a certain degree, an *aponeurosis;* the vessels of the *mesorectum* were slightly injected of a blackish red; the muscular coat was white as snow. There was found on the mucous coat corresponding to the injured portion, the greatest part of the Sublimate employed: this coat was wrinkled, as it were granulated, somewhat hardened, and exhibited several folds of a *clear rose colour,* imitating, by their arrangement, venous ramifications; these folds were separated from one another by portions of an alabaster white colour. On stretching this internal membrane on the hand, the wrinkles could be made to disappear, and it could be rendered smooth. Immediately above these four fingers' breadth, the intestines presented their natural colour, and the membranes were thin and soft to the touch, so that there was a line of demarcation perfectly well defined *between the parts to which the Sublimate had been applied, and those which had not been in contact with it.* The portions of the intestine attacked by the Sublimate were put into water, and twenty days after no sign of putrefaction had manifested itself. They were submitted to chemical analysis after being boiled a long time in water, and metallic mercury was extracted, a proof that the mercurial preparation had been decomposed, converted into muriate of mercury at minimum, which was intimately combined with the animal matter. (Vide Vol. i. Part i. § 73, p. 71.)

Experiment 2nd. At nine in the morning, forty-eight grains of Corrosive Sublimate, under the form of powder and fragments, were introduced into the rectum of a dog in good health. At the end of three minutes the animal uttered complaints, and passed some excrementitious matter tinged with blood. A quarter of an hour after, he uttered plaintive cries, and appeared agitated. The next day the experiment was

begun again, and the same dose of the poison was introduced; the animal died ten hours after. The opening of the body took place the following day. The intestines were inflamed to the extent of *eighteen inches*, beginning at the anus. Far from exhibiting the white colour and thickness which we have described, the serous membrane was red, very much injected, and thin; the Corrosive Sublimate was no longer found in the interior of the intestines (it had probably been evacuated by the stools); the mucous membrane appeared of a blackish gray colour, in the extent of two fingers' breadth, immediately above the anus; nevertheless, on detaching it, and placing it between the eye and the light, it was seen to be of an exceedingly deep red colour. The portion situate immediately above, and which extended to the height of eight or nine inches, was also of a very intense red colour, and was detached easily by rubbing it: beyond this point the redness diminished in intensity, and was no longer perceptible at the height of twenty, or two and twenty inches; but this diminution was effected in a gradual manner, and did not exhibit, as in the preceding experiment, *a line of demarcation well defined, between the sound and the diseased parts.* The muscular membrane was of a bright red colour, throughout the whole extent of the affected portions. It is easy to discover, that in this experiment, the organic lesion was not confined to the spot where the poison had been applied, but that it was extended much further.

Experiment 3rd. A great shaggy dog was hung at noon. Three quarters of an hour after, three ounces of a concentrated solution of Corrosive Sublimate were introduced into the rectum. The body was opened the next day at two in the afternoon. Almost all the great intestines had been in contact with the solution; their texture was whitened and thickened; the mucous membrane exhibited several zig-zag bands, finely clouded of a rose colour, which was contrasted with the white colour of the other portions. Immediately above the part with which the poison had been in contact, the intestine was

in its natural state, so that *there was a line of demarcation perfectly well defined*, a phenomenon which *never* exists when this substance has been introduced during life.

Experiment 4th. A small dog was hung at noon. An hour and a half after, a drachm of Corrosive Sublimate reduced to a fine powder, was introduced into the rectum. The opening of the body did not take place till four days after. The alteration extended only to three fingers' breadth above the anus; the muscular and serous coats were white like alabaster; the mucous membrane exhibited rose-coloured fringes, as in Experiment 1st, which were divided by portions covered with Corrosive Sublimate, and proto-muriate (sub-chloruret) of mercury of a grayish colour. There was also here *a line of demarcation exceedingly well defined*, between the portions on which the Sublimate had been applied, and those which had not been in contact with it.

Experiment 5th. A small dog was hung at noon. The next day at eleven o'clock, a drachm of Corrosive Sublimate, reduced to fine powder, was introduced into the rectum, and the body was opened the following day at noon, that is to say, twenty-five hours after the introduction of the poisonous substance. There was no sensible alteration, except in the space of four fingers' breadth above the anus; the muscular and serous coats were white as snow, thickened, and hardened; there was above the internal membrane a coat of a grayish colour, mixed with white points, and which consisted of the muriate of mercury at minimum (sub-chloruret of mercury), and Corrosive Sublimate: this grayish coat adhered so strongly to the mucous membrane that it was impossible to detach one without the other. This membrane, moreover, exhibited the same gray colour, and did not present *any zone of a rose-colour, nor of a clear red.*

Experiment 6th. The same experiment, repeated three times on human subjects, furnished similar results. There is no doubt, that if the injection had been administered a few

minutes after death, and even an hour after, whilst life was not yet destroyed in the small blood-vessels of the rectum, we should have produced reddish zones, which, under these circumstances, have constantly made their appearance in the dead bodies of dogs. We have never thought of making these experiments on human bodies, because we are convinced that there might be danger, if, by accident, the patient should not be yet dead.

EXPERIMENTS MADE WITH THE ARSENIOUS ACID (ARSENIC OF COMMERCE).

A small robust dog was hung at ten in the morning. Five minutes after, a drachm of Arsenious Acid, in the form of powder and small fragments, was introduced into the rectum. The body was opened the next day at noon. There was a very distinct alteration for the space of four fingers' breadth, immediately above the anus; that is to say, in all the parts to which the poison had been applied; the mucous membrane was of a tolerably bright red colour; the portion corresponding to that place where the serous coat is reflected upon the bladder, exhibited a spot of a blackish red colour as broad as a shilling, formed by extravasated blood; all the other injured parts were covered with Arsenious Acid; the other coats appeared in their natural state, and it was impossible to discover the least alteration in the parts of the intestine situate immediately above that to which the poisonous substance had been applied; so that *there was a line of demarcation extremely well defined.*

Experiment 2nd. At nine in the morning, forty-eight grains of Arsenious Acid, in the form of powder and fragments, were introduced into the rectum of a dog in good health; six minutes after, the animal passed a solid stool, not very copious, in which were found almost all the fragments of the poison. Two days after, the experiment was repeated,

with this difference, that the Arsenious Acid was perfectly pulverized. The animal lost his appetite, fell into a state of dejection, and died ten days after the first experiment. The parts round the anus were excoriated, the integuments detached, in such a manner that there was an ulcer of some extent. The mucous membrane of the intestine exhibited, for two fingers' breadth immediately above the anus, a greenish gray colour internally. The surface next the muscular coat was red. Above this portion, the mucous membrane was of a bright red for the space of six or seven inches, and the redness diminished in proportion as it approached the small intestines; so that there was not, as in the preceding experiment, *a well defined line of demarcation.* The muscular and serous coats of the rectum presented a red colour in the parts near the anus.

Experiment 3rd. A dog of middle size was hung at noon. The next day, at one in the afternoon, a drachm of Arsenious Acid reduced to a fine powder was introduced into the rectum, and the body was opened the following day, twenty-five hours after the introduction of the poisonous substance. The mucous membrane, within the space of two fingers' breadth above the anus, presented two red spots as large as a shilling, upon which was lying the Arsenious Acid. The other coats were in their natural state; the rest of the digestive canal exhibited no alteration, in such a manner that there was a line of demarcation exceedingly well defined, between the parts affected, and those to which the poison had been applied.

Experiment 4th. This experiment repeated three times on human subjects, presented similar results.

EXPERIMENTS MADE WITH VERDIGRIS.

Experiment 1st. A small dog was hung at noon; immediately after, about a drachm of Verdigris in powder was in-

troduced into the rectum, and the body was opened forty-eight hours after. The intestinal canal presented its ordinary appearance, except in the last two fingers' breadth of it immediately above the anus; the interior of this portion of the rectum contained all the poison employed; the coats which composed it were somewhat thickened, and of a greenish blue colour, in such a manner, that the Verdigris appeared to be intimately combined with the membranes. *There was no trace of inflammation or ulceration.*

Experiment 2nd. At nine in the morning, forty-eight grains of Verdigris in powder were introduced into the rectum of a dog in good health; two days afterwards, twenty-eight grains more were given him. The animal fell into a state of dejection, and expired at the end of the eighth day.

Opening of the body. The stomach presented near the pylorus, two blackish spots formed by extravasated blood, in the chorion of the mucous membrane; the inferior half of the colon, and the beginning of the rectum, exhibited several red patches of the size of small peas; the remainder of the digestive canal was sound, excepting the end of the rectum; a little above the anus were seen two ulcers as large as a sixpence, with edges thick and elevated, separated from one another by a multitude of other small ulcers. Those parts of this portion of the intestine that were not ulcerated, were variegated with spots of a deep bluish green colour, and with others of a red colour.

Experiment 3rd. A shaggy dog was hung at twelve o'clock; an hour and a half after, a drachm of powdered Verdigris was introduced into the rectum: the body was opened the next day at two o'clock. There was only the inferior part of the rectum, where the Verdigris had been applied, in which the coats were tinged with a greenish blue colour by the poison; not the least trace of redness was discovered: the rest was in its natural state.

Experiment 4th. Some Verdigris was introduced into the

rectum of two human subjects four and twenty hours after death; the bodies were opened thirty-six hours after, and the same phenomena were observed as in the preceding experiments.

EXPERIMENTS MADE WITH SULPHURIC ACID.

Experiment 1st. A small dog was hung at twelve o'clock; five minutes after, about six drachms of Sulphuric Acid, concentrated to 66°, were injected into the rectum. The opening of the body took place the next day at two o'clock. The exterior surface of the great intestines, from the anus to twelve fingers' breadth above, was thickened, of a white colour, and scattered over with a multitude of injected vessels, which were black and hard, as if the blood had been decomposed by the Sulphuric Acid. The mucous membrane corresponding to the whole of this portion, was of a yellowish colour, and was easily detached in the form of flakes, when slightly rubbed with the scalpel; the muscular coat was white; there was not the least *trace of redness;* the Sulphuric Acid had not blackened and turned to charcoal the textures with which it had been brought in immediate contact. There was seen near the anus some excrementitious matter, which had been attacked by the acid. The portion of the intestines, situate above the altered part, was sound, and in its natural state.

Experiment 2nd. The same quantity of concentrated Sulphuric Acid was injected into the rectum of a great dog, which was in good health: he very soon experienced cruel pains, and died during the night.

Opening of the body. The rectum and the inferior half of the colon were so much thinned by the destruction of their mucous and muscular coats, that at the least touch they rent, and could only be separated by fragments; these pieces, which were of a gray ash-colour, were sprinkled over on their exter-

nal surface with a multitude of small vessels injected of a black colour, and hardened; on their internal surface was found some excrementitious matter, which had undergone alteration, and which could be easily removed. A thick coat was then found of a grayish brown colour, the remains of the mucous and muscular coat, which had been gangrened; this coat might be separated by means of a knife. The superior half of the colon presented on its interior surface a yellow flaky coat, produced probably by the yellow matter of the bile which had been set at liberty by the Sulphuric Acid: the muscular coat corresponding to this portion, appeared gray on its mucous surface, and of a deep red on the serous surface: it was likewise scattered over with vessels injected with black; lastly, the serous coat was of an ash colour; the cœcum and ileum presented an alteration similar, but less intense; the other portions of the digestive canal were sound.

Experiment 3rd. A large shaggy dog was hung; four and twenty hours after, about six drachms of concentrated Sulphuric Acid were introduced into the rectum, which acted principally upon the excrementitious matter, which happened to be contained there in great abundance; hence this was of a black colour, whilst the texture was only slightly grayish.

EXPERIMENTS MADE WITH NITRIC ACID.

Experiment 1st. At twelve o'clock, five drachms of Nitric Acid of commerce (aqua fortis) were introduced into the rectum of a dog in good health: immediately after, the animal was agitated, his belly swelled, and he suffered considerably. He died eight hours after. The opening of the body took place the next morning: the inferior half of the rectum exhibited internally several red points upon a yellow ground; the muscular coat was of a crimson colour, and the serous coat of a very fine yellow. The superior half of this intestine was of a deep red, and exhibited some ulcerated points: the portion

of the colon situate immediately above the rectum was in its natural state for the extent of about three inches; the rest of the intestinal canal up to the pylorus, was of a deep red colour internally, and several blackish patches were seen in it, formed by black extravasated blood.

Experiment 2nd. A small dog was hung at noon: six minutes after, five drachms of Nitric Acid of commerce were introduced into the rectum; and the body was opened the next day at eleven o'clock. The rectum, and about the fourth part of the colon, exhibited the appearance of a solid tube, of a beautiful clouded yellow colour, except near the anus, where it was white. On dividing it, it was seen that the mucous membrane corresponding to this portion had been destroyed, and converted into flakes of a canary yellow, which might be detached with the greatest facility; the two other coats were yellow, except in the part nearest to the anus; immediately above this tube, the colon, less altered, exhibited internally, for the space of about two inches, a kind of hollow cylinder of a yellowish colour, formed by the mucous membrane, and thick enough to allow of its being detached and removed whole and entire. The portion of this intestine nearest the cœcum was also somewhat yellow: in other respects, there was not the least trace of redness or inflammation in the digestive canal.

Experiment 3rd. *M. Tartra* introduced two ounces of Nitric Acid of commerce into an empty stomach, isolated from the body, and connected with the œsophagus and duodenum: he let it remain for two hours, and he perceived that a considerable quantity of gas was disengaged. The great extremity and the long curvature of the stomach presented at the same moment some very broad spots, which at first appeared white on the external surface of this organ, shortly after became yellow, and extended at the end of a few hours, so that the coats of the stomach appeared greasy, and yellowish on the inside as on the outside. In another experiment, the

acid remained four days in the stomach, and the alteration was carried to a great extent. This viscus fell into pieces on the least handling; it might have been easily reduced to a sort of greasy paste under the fingers, of a very fine yellow colour.

Experiment 4th. These experiments presented similar results when the acid was introduced into the stomach while still forming an integral part of the body; nevertheless, all the parts in the vicinity of the stomach were secondarily affected when the acid was in sufficient quantity, or when it remained a sufficiently long time in this viscus.

Experiment 5th. Before introducing the Nitric Acid, *M. Tartra* injected into the stomach different fluids, such as water, wine, brandy, milk, broth; under these circumstances, the action of the caustic being weakened, it was much less intense; sometimes the mucous membrane appeared very little affected; more frequently, it had a yellowish tinge, appeared to be slightly thickened, unctuous under the fingers, and separated easily from the exterior membranes. It is evident, that the alteration of the textures ought also to be less when the stomach contains solid food on which the Nitric Acid might exert its action.

1077. It results from the facts just described:

1st. That the corrosive sublimate, arsenious acid, verdigris, and the sulphuric and nitric acids, when introduced into the rectum a few minutes after the death of animals, give rise to alterations of texture which imitate to a certain degree, those produced by the ingestion of these same substances during life.

2nd. That it is nevertheless easy constantly to distinguish them by the following character: A. In case the poison has been introduced after death, it is found in tolerably large quantity at a very small distance from the anus, at least if it has not been employed in the form of solution; whilst, if introduced during life, it is in small quantity, owing to the greater part of it having been expelled by the stools which

it produces. B. The alteration of texture never extends beyond a small distance from the part to which the poison has been applied after death, in such manner that there is *a line of demarcation exceedingly well defined* between the affected parts and those which are not at all so; a phenomenon, which, in the other case, never happens. In fact, these poisons act on the living subject by producing a strong irritation; to which succeeds an inflammation, of a variable degree of intensity, but which always extends far beyond the place where they have been applied, and which decreases insensibly, in proportion to the distance from the point most inflamed, so that there never is *a line of demarcation perfectly marked out*. C. The redness, inflammation, ulceration, and other lesions, are carried to a length infinitely greater when the poison has been introduced during life, than when it has been applied after death; so likewise, if on examination of the body, the rectum or stomach be found covered with a tolerably large quantity of one of these poisons, and the lesion not very decided there will be very strong reasons to believe, that it has been applied after death.

3rd. That amongst these poisons there are some that produce lesions so characteristic when applied after death, that it is impossible to mistake them; such are the corrosive sublimate and nitric acid.

4th. That when they are introduced into the digestive canal, four and twenty hours after the decease of the person, they no longer excite either redness or inflammation, because life is entirely destroyed in the capillary vessels; and consequently there is no longer a possibility of confounding these cases with the poisoning, which takes place during life.

5th. Lastly, they are capable moreover of producing inflammatory phenomena, when applied an hour or two hours after death; but that it is sufficient, in order to form a correct judgment, to attend to the considerations we have just established.

We purposely omit noticing the experiments of Savary, relative to the application of caustics to the skin during life, and after death; the results of those labours not appearing to us to apply directly to the subject we are treating.

ARTICLE V.

Of the Poisoning of a Number of Persons at once.

1078. The instances of several persons being poisoned at the same time, are by no means rare; and they appear, at first sight, to present no interest to the juridical physician. In fact, if at an entertainment, where there are a number of guests, a poisoned dish should be served up, whether by mistake or malice, and a short time after, all of them experience similar symptoms, sufficient to substantiate the poisoning, the practitioner ought to act according to the principles which we have hitherto laid down. But the case is not the same should only a few of the guests be attacked, whilst the rest experience no inconvenience; or if some experience only slight symptoms, whilst others die, or become a prey to alarming symptoms, &c. It is evident, that this disparity of effects, where there appears to be only one cause, must render this case of medical jurisprudence more complicated; since it is required to render an account of a multitude of apparent contradictions which present themselves. Before laying down the precepts which ought to direct the practitioner in this thorny track, we shall report an observation of the celebrated *Morgagni*, calculated to throw a light on this subject.

"In the month of May, 1711, four persons, that is to say, a priest, two women, one of which was his sister in law, and another person, all in good health, and on a journey, stopped at an inn to dine. Setting out on their road after dinner, the priest in a short time felt himself so ill in the bowels, that he was obliged to dismount from his horse. Notwithstanding the copious evacuations, both upwards and downwards, the pains

increased every moment, and it was necessary to take the patient back to Césenne, the place where they had dined, and where the priest arrived half dead. A medical man who was called in, thinking he had only to deal with an ordinary colic, employed a number of fomentations, glysters, purgative draughts, anodynes, &c. Although he saw that one of the women had also strong evacuations with pains and faintings, and that the other person complained of pains, and of a weight at the stomach, he never suspected the presence of a poison, because the other woman had no complaint, and the landlord protested with many imprecations, that there was nothing dangerous in his dishes; however, the evacuations saved the patients, and as they diminished a little the next morning, it allowed of their removing into the neighbourhood of Morgagni's residence, whom they immediately called in. This great physician having ascertained whether there was any dish at the table of which the woman who was in good health had not eaten, and having found that it was a great dish of rice which had been first served up, concluded from this circumstance that it was this dish that contained the poison. The difficulty however was, that the priest, who had eaten the least, and who had been on the whole extremely abstemious, was precisely the person who had suffered the most, and the soonest; that the woman, who had eaten more than the priest, had been less sick than he; and that the other person, who had eaten more than all the rest, was the one who was the least incommoded. Was there no cheese rasped over this rice? demanded Morgagni. They answered in the affirmative; the priest, who had little or no appetite, ate scarcely any thing but the cheese. In that case, said Morgagni, you understand already that there was arsenic among that cheese, which had probably been prepared for killing rats; and not having been laid away with sufficient care, some one had taken it to serve up with your rice during the time that you were hurrying the landlord to send up your dinner. These conjectures were

verified by the confession of the landlord himself, who, having learned that the patients were out of danger, was no longer afraid to acknowledge that such had been the cause of this unfortunate accident. *Morgagni* was only astonished that they had not found any ill taste in the cheese; he succeeded however in restoring fortunately these three patients, by the use of milk, whey, and oil of sweet almonds; but the priest was afterwards affected with different symptoms, which it is not necessary to relate here."*

1079. The practitioner will not be able to form a correct judgment in cases of this kind, if he neglect to pay attention, 1st, to the state of the stomach of the different persons poisoned: in fact, those who have taken a great quantity of food or drink, would feel in general less severe symptoms than others; 2nd, to the nature of the dishes and of the drinks, as well as to the quantity that each person may have eaten or drank; 3rd, to the existence or absence of vomitings and stools. It is evident that it may happen, that some persons have eaten a tolerably large quantity of a poisoned dish, without any serious symptoms taking place, for this very reason, that the quantity of the food was considerable, and that it produced easily copious evacuations, by means of which the poison had been expelled.

ARTICLE VI.

Of Poisoning, the result of Suicide or Homicide.

1080. It may be easily conceived that chemical analysis, and the inductions drawn from the symptoms and lesions of texture, are insufficient to resolve this difficult question: we can only then endeavour to throw light on it by the assistance of moral considerations. "We should attentively examine," says the Professor *Fodéré*,

* Fodere, op. citat. tom. iv. p. 242.

" 1st. Whether the subject had been affected for some time past with a melancholy delirium; whether he has sustained any losses; whether his hopes have been disappointed; whether he has experienced any poignant grief.

" 2nd. Whether any of the persons with whom he lived, or with whom he associated, or with whom he had any kind of connexion, had any interest in his death.

" 3rd. The season of the year should also be taken into consideration; for I have observed, and without being sufficiently able to assign any reason for it, that suicides were more frequent during the periods of the solstices and the equinoxes.

" 4th. Whether the patient, instead of making complaints, remains quiet, seeks solitude, and refuses the aid of medical men and of medicines.

" 5th. Any kind of writing, which persons commonly execute previously to committing the act of suicide, in order to express their last sentiments, or their last wishes, is one of the most certain proofs, that they alone are guilty of their own destruction. As for the remains of the poison found in their pockets or in the room, they are a very equivocal sort of guide, and which may belong as much to homicide as suicide.

CHAPTER II.

ARTICLE I.

Of Slow Poisoning.

1081. It sometimes happens, that persons swallow, for several days in succession, a small quantity of poison, not capable of producing a speedy death, but which occasions symptoms more or less grievous, which may, in the end, have the most fatal consequences: the combination of accidents arising from a cause of this kind, constitutes *slow poisoning*, which must not be confounded with *consecutive* poisoning. In fact, this latter is occasioned by the ingestion at once only of a certain quantity of poison, which produces at first all the symptoms of acute poisoning, to which the patient opposes resistance; but which are followed by a multitude of consecutive phenomena, the duration of which varies considerably.

We do not admit, that any *slow poisons* are known, by means of which death can be procured at any determinate epoch. This assertion, engendered by ignorance, and kept up by absurd prejudices, is altogether contrary to the laws of organic nature. How in fact can we determine *a priori*, the resistance that the vital powers will oppose to the cause tending to destroy them, a circumstance, without which it is not possible to fix the epoch at which the symptoms will take place, and when they will be followed by death? Might we not here seize the opportunity to combat with success, one of the most generally received opinions amongst a very great number of

medical men, and which is nearly allied to the present question, that is, that in many kinds of diseases, there are determinate and constant days, when the patient is much more severely affected? It will be sufficient to reflect on the great diversity of causes which are capable of developing these diseases, on their variable intensity, the different degree of reaction, &c., to be convinced, that of two persons having the same affection, the one might present severe symptoms on the same day, as the other would be in a situation much more satisfactory.

The following facts may serve to throw a light on the history of *slow poisoning*.

Observations.

1st. A sailor, twenty-six years of age, of a tolerably good constitution, but debilitated by long and frequent sea-voyages, was admitted into the Hospital of Land . . . . the 5th Fructidor, year 7, for a syphilitic disease, with which he had been infected, for the first time, for three months. The first symptom of the disease had been a gonorrhœa, which an injection of brandy, diluted with water, thrown up the urethra, had suppressed in the course of eight or ten days. As no fresh symptoms succeeded to those which disappeared, the patient believed himself perfectly cured, and a few days after, departed with the ship, on board which he was embarked. He informed me, that on the very day he set sail, he felt pains in the groins, at first not very severe; that these pains increased every day in intensity, and he perceived a small tumor on each side; having no doubt that they were buboes, (these were his expressions,) he consulted the surgeon of the ship, who applied to each groin, a linseed-meal poultice: beside which he desired him to come every day, to take a glass of some drink, which left a very disagreeable taste in the mouth. I have since learned, that it was a solution of oxygenated muriate of mercury.

The buboes continuing to grow larger for several days, softened at length in their most prominent part, and an incision made in each of them, gave discharge to a very small quantity of thick bloody pus. The patient still continued the use of his pretended drink, paying very little attention to regimen, although expressly forbidden to drink any spirits or wine, and his rations of both being in consequence stopped.

The buboes were dressed with a pledgit covered with a mixture of cerate and mercurial ointment, and, above all, a poultice of linseed meal.

Being clear from the severe pains which he had felt for several days, this man resumed his laborious occupations; from that moment, it was necessary to restore him his rations of wine and spirits, which they had no longer the right to refuse: he followed altogether the diet of sailors; neglecting the dressing of his buboes, and seldom tasting the drink prescribed for him, he almost forgot his complaint altogether. The cruize was protracted, many circumstances contributed to render it disagreeable and fatiguing. This man, tormented by his situation, forced to undergo excessive fatigues, wanting good nourishment and change of linen, having almost constantly wet clothes on the body, and obliged to pass from a climate hot and moist, to one continually cooled by winds more or less violent; this man, I say, soon began to feel the attacks of a disease so fatal to mariners, and from which so little care is taken to preserve them: I mean the scurvy.

A sense of weakness, pains in the limbs, lassitude, languors, inaptitude to labour, disgust for his ordinary occupations, swelling of the legs, frequent hæmorrhages from the gums, a bad state of the mouth, the difficulty of eating biscuit increasing; all these symptoms combined, announced to him a disease which he had learned to distinguish, having been several times attacked with it.

This was rendering the first disease complicated: he thought it was best to defer the treatment of both of them to a more

propitious season. He consequently finished the cruize in this deplorable state.

The ship in which he was embarked, came into Brest; a few days after he was sent to the Hospital of Land. . . It was there that I had first occasion to see him.

He told me that he had never been sick before his first cruize, which lasted five months, three of which were passed at sea, and two at Cape Français. The ship, on board which he was embarked having gone into Rochefort, he was sent to the hospital for treatment at the beginning of his scurvy. He was there attacked with the endemic disease of that country, which he had for four months. He left Rochefort in a state of convalescence, and passed to the Port of Brest, to which he belonged: he made several voyages, from which he returned in tolerable health, except a little touch of scurvy, which yielded to a few days' treatment on shore.

This is, as far as I have been able to collect it, a picture of his situation when submitted to my observation.

This man, who was tall and of a brown complexion, seemed to exhibit the remains of a good constitution, but one which many causes had contributed to deteriorate: his countenance was pale, saturnine; the eyes dull, sunk in their sockets; the cheek-bones prominent; the skin of the face drawn up; the lips thick, of a pale red colour; the gums detached, blackish, from which oozed a bloody fluid: the degree of emaciation was extreme; the legs were slightly swelled. The patient had in the right groin, an ulcerated tumor, from which flowed a very small quantity of purulent matter. The bubo of the left side was cicatrized; but there still remained a very considerable fulness of the glands of that side. The patient felt pains in the limbs.

This man at first was put on an antiscorbutic treatment, a vegetable diet, frequent exposures to the sun, a pure air, which, with the use of antiscorbutic medicines, soon brought about a change in his condition very decided. In the course

of six weeks of this treatment he had recovered a certain degree of flesh, the swelling of the legs had absolutely disappeared, the mouth was in a better condition, the skin resumed its natural colour, the pains decreased; his strength increased daily, and every thing seemed to announce a speedy convalescence; but the buboes remaining still in the same state, the surgeon to whose care he was committed, thought it necessary to submit him to an antivenereal treatment: there was consequently administered to him a solution of the oxygenated muriate of mercury, in the dose of a spoonful of the liquor of Van Swieten in a glass of milk, twice a day: to this was added some sudorific drink.

This man took ninety or a hundred spoonfuls of the solution without any decided effect resulting from it, unless it was some degree of emaciation. The bubo on the right side continued to suppurate, and the swelling on both sides was very considerable; the surgeon thought it proper to persist in the use of the oxygenated muriate of mercury; but from that time its effects began to shew themselves in a terrible manner. The patient experienced at first slight colics, but they became in a short time violent and continued. The digestion becoming extremely painful, it was necessary to reduce him, for the whole of his diet, to a little rice-cream. He was constantly tormented by nausea, and putrid eructations. Singultus always followed the introduction into the stomach of any kind of solid food. In a short time he was only able to lie upon the back; a degree of fever took place, with slight exacerbation towards evening, followed by copious sweats about the breast and head; the bubo of the right side became painful; the suppuration, which was copious and fetid, acquired such a degree of causticity, that by corroding all the surfaces with which it came in contact, it produced a great number of small ulcers, which increasing daily, united at length and formed one single one of prodigious extent, which occupied the whole of the groin and abdomen on the right side.

The use of oxygenated muriate of mercury was at length discontinued, at the request of the patient, at the hundred and fiftieth spoonful of the solution; but it was too late: the poison had exerted a fatal action upon the organs; the state of the patient grew every day worse, the emaciation became extreme, and this unfortunate man, who was given up to the most excruciating pains, after lingering out a miserable existence, expired on the 21st Nivose, the hundred and thirty-sixth day after being admitted into the hospital. The excessive fetor of the dead body prevented us from opening it.*

2nd. We have reported, Vol. i. Part i. p. 149, an Observation, in which small doses of the Arsenious Acid were administered at several different times.

3rd. "At thirty years of age, being born with a sanguineous and bilious temperament, and having been married a year before, I was enjoying vigorous health, notwithstanding the excesses of my youth, when I was called to Paris to fill an important post.

"During a year, for which time my functions lasted, I was overwhelmed with bitterness and sorrow, and in the end my health was sensibly altered.

"On returning home, I thought myself labouring under a disease of the liver; every morning my tongue was very dry, and even chapped; my sleep was painful, and when, immediately after rising, I took a glass of water, I experienced sometimes eructations full of bile. I thought that a vomit was necessary, and prepared myself for it by drinking whey, and diluting drinks, with low diet.

"Four grains of emetic tartar produced no effect: the same thing happened from six grains, which I sent for immediately, desiring the apothecary to be asked whether he were certain of its being good. I afterwards added four grains more; and these fourteen grains, taken in twelve small glasses of water,

* Lavort. Dissertation already quoted, p. 38.

(less than two bottles) and in less than two hours time, produced only a weak vomiting, with a slight tinge of bile.

" In the afternoon, I passed about three stools of pure bile, and during one of them, I experienced a tolerably severe griping in the left hypochondrium; a slight tenesmus came on, with oozing from the anus.

" In the evening I ate a fish *au bleu*, I slept with a profound and tranquil sleep; and the next morning on waking, my tongue and mouth were in so good a state, that I kept myself on low diet all the day, with the intention of taking, on the morrow, a fresh dose of emetic tartar to procure a complete vomiting.

" In fact, the next day, I took eight grains of emetic tartar in six small glasses of water, that is to say, in less than a bottle, in the course of one hour, and this emetic produced no effect. I then persuaded my wife to procure me twenty grains, in order to double the dose of the evening before, but she was alarmed at my project, and prevented me from taking any more emetic tartar. I took the method of drinking, one after another, six great cups of warm water, and nevertheless I was not able to vomit. Lastly, by means of my fingers passed down my throat, I succeeded in throwing up a very small quantity of the water I had taken.

" I then gave up the idea of making myself vomit; for the water that I had taken flowed off by urine, and I passed towards night two or three stools of pure bile: I ate with pleasure and appetite a fish *au bleu*, before going to bed: I slept soundly and peaceably the whole night, and the next day my mouth and tongue, instead of being dry and chapped, were cool, and in a good condition.

" Nevertheless, that same day my tenesmus increased, and when I was at the close-stool, I perceived that the evacuations were covered with a glairy matter, and scattered over with bile in a grumous state, some pieces of which, unmixed with other matter, were of the size of a lentil.

" My stool being entirely finished, I passed without pain and without the slightest mixture, the quantity of a small plate full of matter absolutely similar to melted tallow which begins to grow solid, and a similar circumstance occurred every time I went to stool for eight or ten days.

" Notwithstanding the violent exercise I was in the habit of taking, I was very fat; but at the end of eight or ten days, I was fallen into a state of excessive leanness; the skin of my belly seemed glued upon my loins, and my tenesmus, the only thing I suffered, gave place to a continual flow, and allowed me only with the greatest difficulty to walk, or remain erect.

" A physician recommended to me aperients; I made use of them for several months, and my health was no better.

" I had no looseness, but the stools were no longer so good as before: they were always more or less covered with a glairy matter; and the tenesmus, as well as the flow of whitish matter from the anus, increased instead of diminishing, &c."*

4th. We have reported (Vol. i. Part ii. p. 469.) a case of poisoning by lead, which may very well enter into this article.

1082. We have tried several experiments on dogs, with the intention of determining the action of small doses of poison frequently repeated; but it may easily be conceived how painful, fastidious, and difficult a task it is: so likewise have we not been able to obtain results so satisfactory as we should desire. We have however observed, that the disease produced by the poison in small doses, presented a very strong resemblance to that which results from the ingestion of a greater quantity; the same may be said of the lesions of texture.

Should then the juridical physician be called in to decide on so difficult a case, he must keep in mind a great number of

* *Mémoire de M. Magendie sur l'Emetique*, p. 28.

physical and moral circumstances that may throw light upon it. Thus, for instance, he should examine whether the disease, which is the subject of his researches, does not depend rather on the bad constitution of the patient than on the slow action of a poisonous substance; whether it does not belong to some hereditary or other organic affection: he should pay attention to the prevailing diseases, epidemic or endemic; to any inconsiderate habit of taking medicines, and especially purgatives; to the abuse of bleeding; to violent exercise, or any other error in the patient's way of living; to the violence of the passions; to the valetudinary, hypochondriacal, and melancholy state of certain persons, &c.

ARTICLE II.

Of Accidents consecutive to Acute Poisoning.

1083. It often happens, that persons who have been poisoned by any energetic poisonous substance, experience the most grievous symptoms, which are not however succeeded by a sudden death. The state of these patients improves for a few days; but in a short time severe symptoms take place, which may be more or less prolonged, and which generally terminate fatally. We shall relate some observations on this subject.

Observations.

1st. *Marie Ladan*, fifty-three years of age, drank about a spoonful of *aqua fortis*, thinking it to be common water. She very quickly threw up by vomiting the greatest part of it. Immediately after, came on hiccup, copious eructations, nauseas, repeated vomitings. Half an hour after, she was bled in the arm, and mucilage of gum arabic was given her, and milk. The first symptoms subsided by degrees; but an excessively obstinate constipation, with which she was tormented

from the beginning, continued unaltered. At the end of ten days of treatment, and evident decrease of the symptoms, this patient ate, for the first time, a little vermicelli, and immediately vomited it. Since her accident, she passed a great quantity of saliva, and her breath was incredibly fetid; but in the matter that she vomited there was no membranous portion; only at the bottom of her throat she thought she felt the presence of some foreign body, which incessantly fatigued her, annoyed the deglutition and breathing, altered her speech, &c. On the twentieth day from her poisoning, after having made many efforts, she passed by the anus, a long membranous substance in one single piece, folded and rolled up, which represented the form of the œsophagus and stomach, with all their dimensions, and which was nothing less than the interior membrane of these organs, which had been raised and separated in all its points at once; it was one or two lines in thickness, and of a very distinct brown colour. The portions corresponding to the great and small extremities of the stomach were worn thin, and perforated with several holes. From that moment, the sensibility of the digestive canal became excessive, the vomitings were more frequent, and it was impossible to make her retain any food on the stomach. Milk, which had been her support for fifteen days, was now vomited in the state of curds. A few days after, the patient felt herself better, and ate some soup, eggs, and some small biscuits, and only vomited now and then. Her bulk was singularly decreased, but she preserved a great degree of freshness in her countenance, and was able to walk about a little: darting pains at the stomach, a most obstinate constipation, and a sort of continual uneasiness, incessantly opposed her recovery. These symptoms increased; the excessively copious salivation, which tormented her ever since the accident, was every day greater; all she took was thrown up; the intellectual faculties were in their natural state; the membrane of the lips and the

inside of the mouth, though sound in appearance, was removed by the slightest touch; the patient exhausted herself by fruitless efforts to vomit. At length, two months after the accident, she experienced a sudden shock, and died.

Dissection of the body. The cardiac and pyloric orifices were sensibly contracted; the interior surface of the œsophagus and stomach were very smooth and polished, spotted and clouded with a red colour more or less bright, and had none of its ordinary appearance; this last organ was singularly diminished in bulk. The intestinal canal did not appear to be much contracted, and all the abdominal viscera were found nearly in their natural state.

M. Tartra, from whom we have borrowed this observation; asserts that, in cases of this kind, the symptoms produced at first by the nitric acid decrease insensibly; but that the patients preserve a great disposition to vomiting. At the end of a certain time, the internal membrane of the digestive canal is struck with death, and thrown up, either entire or in small portions as it were putrid and puffed up. When death happens at a late period, the patients fall into a *marasmus*, because the digestion can no longer be carried on; they are tormented by a pressing desire to go to the close stool, without being able to evacuate; and sometimes three months elapse without their being able to pass any thing more than a few very small masses of excrementitious matter, moulded into the shape of pills of a few grains, at one or two different times; the emaciation becomes excessive, the countenance disgusting; they spit every moment, vomit incessantly sloughs or putrefied portions of the membranes, of an infectious smell, resulting from the exfoliation of the œsophagus and stomach, the shape of which they sometimes preserve. In some instances, these substances are brought away by stool. "The skin becomes dry, scaly, almost dead, and inert as in old age. The physical faculties are extinguished; the moral faculties are some-

times degenerated in a singular manner: there remains, if such an expression is allowable, nothing but the image. Those ravages, which according to the natural order of things, ought to be the progressive result of many years, are the effects only of a few months; every thing in these subjects presents the appearance of an accidental and premature decrepitude. The patient still exists, but he is only separated by an interval, which may be called almost imperceptible, from death, which is every day anticipating, and appropriating to himself by piece-meal, a portion of the domain of life.*

After the death of these persons, the digestive canal is found reduced to an extreme degree of smallness: it might be contained in the hollow of the hand. The intestines are of the same diameter as the little finger; sometimes they scarcely equal the size of a large goose-quill. Their coats are extremely thick; their cavity null, or almost null, and contains only a small quantity of mucosity. In some cases, the stomach adheres to the diaphragm, liver, or spleen. Sometimes these adhesions are simple, but most commonly, the coats of this viscus are disorganized and exfoliated; in that case, the organ, which is found to be in contact with the stomach, and which adheres to it in this part, which is completely burned, serves it for a covering, or rather, it is its external membrane which adheres to this *lacuna*, or sort of hole; it becomes thickened a little, but nevertheless remains sufficiently transparent for the colour of the texture of the viscus, which it covers, to be perceived. The orifice of the pylorus is so drawn up, that it is sometimes impossible to introduce a probe. There are perceived on the internal surface of the stomach, in its greater extremity, near the pylorus and the cardiac orifice, in the œsophagus, fauces, and pharynx, some smooth patches of a vermillion colour, or cicatrices, produced by the regeneration of the mucous membrane.

* Tartra. Op. citat. page 169.

2nd. *Adam Péteur*, forty-six years of age, was employed for twenty-eight years, in coating porcelain with white lead. He experienced the first metallic colic in 1795: he was treated for, and cured of it at the *Charité*. Five months after, he had another; and from that time he was attacked with it every year. In 1802, he experienced pains, which increased gradually. He had remarked, for six weeks past, that his arms were become more weighty and feeble; it was likewise from this moment that the colics had decreased considerably. This phenomenon happened in the course of twenty-four hours; the patient's own expression was, that *the colic had fallen into his arms.* He entered the Charité, the 17th Ventose, year xi, (1803), and was in the following condition.

Appearance of old age, remarkable slowness in his answers, slight head-ache, temporary shiverings, no vomiting. He felt very little griping, the belly was somewhat depressed, he had no constipation; the pulse was rather rare than frequent, the arms were still a little moveable; the *extensores* muscles of the hands were paralyzed, as well as those of the fingers. His sleep was tolerably good; he walked about some time during the day.

On the 18th, he had an attack of epilepsy (it had already happened before since his admission to the hospital); he lost his senses, experienced convulsions, and foamed a little; the tongue was yellowish, somewhat dry, and not at all bitter. *(Sudorific ptisan, purgative glyster of painters, and anodyne; theriaca.)*

The 19th, no attack; in the same state. *(Cassia water with the seeds and two ounces of glauber salts, sudorific ptisan, anodyne glyster, julap.)*

The 20th. Pains in the arms and legs.

Up to the 13th Germinal, this patient had remained in a state of health that was fluctuating, being in general pretty

well for one in his situation, but finding himself better on some days than on others. His power of moving returned slowly; the gripings were dull and slight. His treatment consisted during all this time in sudorific ptisans, sometimes rendered laxative, anodyne glysters, antispasmodic draughts, extract of juniper, theriaca, &c. He was also purged several times. On the 27th, he had an epileptic fit.

The 14th Germinal, stupor, convulsive movements in the face, cough without expectoration; pulse feeble, small, and frequent; the night uneasy; slight wanderings. *(Whey with tamarinds, succory and* burago, *pills of camphor and nitre.)*

On the 15th. Prostration of strength, lying on the back, *subsultus tendinum,* eye dead and dusty; skin dirty, earthy, impregnated with a dry and acrid heat. *(The same prescription.)*

The 16th. Prostration extreme, convulsions of the muscles of the face, continual *subsultus tendinum,* general tremblings scarcely any knowledge. *(Cassia water, in other respects the same prescription.)*

The 17th. Situation the same; but a greater degree of debility. He died at three in the afternoon.

Dissection of the body. Remarkable leanness; skin earthy, eyes dusty. The meninges of the brain were in their natural state; the brain itself was very sound; the ventricles contained scarcely a small quantity of serosity; the heart, although free from *coagula,* was in its natural state; the lungs, which were free from all adhesion, were a little unequal in their size; the left was the smallest, and sound; the right more bulky, somewhat firm, and distended with blood of a brown-red colour; its specific gravity was greater than that of water, since it sunk to the bottom. The liver, spleen, and pancreas, were sound; the omentum was adhering to the peritonæum, near the liver; the stomach and intestines were in their natural

state, not exhibiting any red spots, and containing excrementitious matter in very small quantity: the colon was tolerably narrow, but easily dilated; the muscles were of a tolerably deep red; the bones brittle. (MERAT, *Dissertation Inaugurale*, p. 157.)

FINIS.

J. M'Creery, Printer,
Black-Horse-Court, London.